HIRS 2025

HORIZON CAMPUS

# Horizon Interdisciplinary Research Symposium

UNITED IN INQUIRY :
EXPLORING THE FUTURE THROUGH INTERDISCIPLINARY LENSES

ISSN 2961-5739

# 1st International Conference

# HORIZON INTERDISCIPLINARY RESEARCH SYMPOSIUM (HIRS 2025)

**UNITED IN INQUIRY: EXPLORING THE FUTURE THROUGH INTERDISCIPLINARY LENSES**

## PROCEEDINGS OF HORIZON CAMPUS RESEARCH SYMPOSIUM


## HORIZON CAMPUS

**19-21 November 2025**

**INTERNATIONAL SYMPOSIUM**

**ISSN 2961-5739**
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**ABOUT HORIZON CAMPUS**
Horizon Campus is a Ministry of Education-approved, non-state higher education provider established in 2014. Through strategic partnerships with leading international universities, Horizon brings global best practices to Sri Lanka. We are committed to transforming student lives through high-quality education, and this International Research Symposium is a testament to that commitment.

**ABOUT HIRS 2025**
The Horizon Interdisciplinary Research Symposium (HIRS 2025) is a visionary initiative led by the Vice Chancellor, Prof. S. J. B. A. Jayasekera. Organised under the leadership of Mr. J. Chrishankar, a Senior Lecturer in the Faculty of Management, this landmark international symposium event is the first of its kind at Horizon Campus.

Adopting a hybrid format, HIRS 2025 broadens participation by enabling international researchers to present online while accommodating a local in-person audience. The symposium received an overwhelming response, with over 278 abstract submissions, establishing it as a premier platform for sharing knowledge and advancing academic credentials.

A key outcome of this symposium is the forthcoming Transdisciplinary Journal of Research and Development (TJRD). Selected researchers from HIRS 2025 will be invited to submit their upgraded work for publication in this open-access journal, which is scheduled to launch in February 2026. This integrated pathway from presentation to publication is a distinctive feature of our commitment to academic development.

For inquiries regarding publication, please contact: chrishankar@horizoncampus.edu.lk
**Symposium dates:** 19th -21st November, 2025

**DISCLAIMER**
The editorial team has used Turnitin to review for plagiarism or any foreseeable malpractice. Researchers take responsibility for the data and information presented in these research articles.

**ACKNOWLEDGEMENT FOR ARTWORKS**
We would like to acknowledge the creativity and efforts of Ridma Shalitha, a student in Intake 11 of the BM (Hons) in Marketing program. He played a crucial role in creating these visual elements.

## A Message from the Chairman

It is with a profound sense of purpose and great pride that I welcome you to the Horizon Interdisciplinary Research Symposium (HIRS).

When we envisioned Horizon Campus, we had a clear goal to become the most prominent private tertiary educator in Sri Lanka, recognised for not only quality but also innovation. We committed to a path of relentless pursuit of excellence, aiming not just to participate in the educational landscape, but to redefine it. Our rapid ascent, culminating in our status as a young non-state HEI in SLANSHEI, is a testament to this unwavering academic focus and the dedication of our entire community.

Today, HIRS stands as a powerful symbol of that vision in action. This symposium is not an isolated event; it is a strategic imperative. True quality in education is not confined to the classroom—it is forged in the fires of inquiry and discovery. By championing research, we directly enhance the intellectual caliber of our students, equipping them not merely with degrees, but with the critical thinking and problem-solving skills that define future leaders.

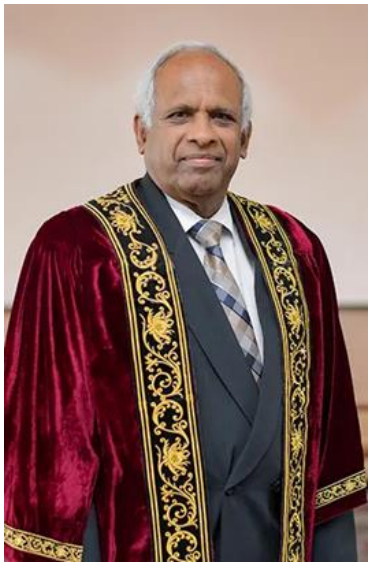
Moreover, this gathering is a crucial bridge to the industry. The research showcased here has the power to create meaningful, sustainable links with the corporate and industrial sectors, ensuring that our academic pursuits are relevant, impactful, and aligned with the nation's needs.

I see HIRS as a clear indicator that we are on the right path. It embodies our commitment to reaching for higher success and solidifying our position as a beacon of quality education. My congratulations to all the academics, students, and staff who have made this vision a reality.

Let the ideas shared at this symposium ignite a wave of innovation, strengthening our collective commitment to building a brighter future!

**Mr. Upul Daranagama**
**Chairman**
HORIZON CAMPUS
Knowledge City Malabe, KCM Drive, Off Millennium Drive,
Malabe, Sri Lanka

## A Message from the Vice-Chancellor



It is with great academic pride that I extend a warm welcome to you all for the Horizon Interdisciplinary Research Symposium (HIRS). As the Vice Chancellor, my primary focus is on the intellectual heartbeat of Horizon Campus—the rigor of our academic programs, the advancement of knowledge within our faculties, and the cultivation of a disciplined, scholarly environment. This symposium stands as a vibrant testament to the success of these endeavors. It is the culmination of our academic calendar, where theoretical knowledge is translated into impactful inquiry.

I commend the Deans and academic staff across all our faculties. Your dedication to scholarly excellence and your commitment to mentoring the next generation of thinkers are the cornerstones of this event. The research presented here today, spanning diverse disciplines, reflects the high standards and intellectual curiosity we foster within our halls. This gathering is a powerful demonstration that the most complex challenges are solved not within isolated fields, but at the dynamic intersections between them. To our students, your presence as researchers and presenters is a clear indicator of your academic growth and discipline. You have applied yourselves with diligence, and this platform is your opportunity to contribute meaningfully to the academic discourse. Continue to engage with intellectual integrity and courage.

Finally, I urge every participant to use this symposium as an opportunity for robust academic exchange. Challenge one another's ideas respectfully, forge new collaborations across faculties, and uphold the highest standards of scholarly conduct. Let us use this gathering to not only share knowledge but to also strengthen the academic foundations upon which our institution is built.

**Prof. S. J. B. A. Jayasekera**
BSc(Agric.) Lyallpur, PhD (Reading, U.K.)
**Vice-Chancellor**
HORIZON CAMPUS
Knowledge City Malabe, KCM Drive, Off Millennium Drive,
Malabe, Sri Lanka

## A Message from the Deputy Vice-Chancellor

It gives me immense pleasure to welcome you to the Horizon Interdisciplinary Research Symposium (HIRS). From my perspective, which focuses on our global partnerships and strategic outreach, this event represents a significant milestone in our journey of international academic collaboration.

HIRS is far more than a platform for presenting research; it is a dynamic hub for partnership and a testament to the strong global networks we have built. The success of this symposium is measured not only by the quality of the discourse within these halls but also by the prestigious institutions it has brought together.

We are particularly honoured to welcome students from our partner, Birmingham City University, whose participation enriches our dialogue and strengthens our transcontinental academic bond. Similarly, I take this opportunity to appreciate the involvement of students from the University of London's Law Faculty, studying here in Sri Lanka, and La Trobe University for their proactive role in promoting this symposium. This collaborative spirit is the very essence of a modern, globally connected university system. Seeing our students and academics engage with these international peers is a powerful validation of our strategy. These interactions are the seeds of future joint research projects, student exchanges, and lasting professional relationships. My congratulations to everyone involved in making this partnership vision a reality. Let us continue to build on this success, forging even stronger links that will define the future of global education and research.

Welcome to HIRS.

**Dr.K.Ruwan Perera,**
Ph.D, LL.M.,LL.B(Hull,UK)
**Deputy Vice Chancellor**
**Dean-Faculty of Laws**
HORIZON CAMPUS
Knowledge City Malabe, KCM Drive, Off Millennium Drive,
Malabe, Sri Lanka

## A Message from the CEO

It is with great pleasure that I welcome you to the Horizon Interdisciplinary Research Symposium 2025 (HIRS). This event exemplifies the collaborative excellence that defines Horizon Campus, bringing together the dedication of our academic staff, the passion of our students, and the professionalism of our administration.

I extend my sincere gratitude to our academic staff, whose research excellence and commitment to scholarship form the foundation of this symposium. Your work inspires innovation and drives meaningful discourse within our academic community. To our students, I extend my sincere appreciation for your invaluable contributions as both researchers and volunteers. Your intellectual curiosity, fresh perspectives, and unwavering commitment bring life and energy to HIRS. You are not merely participants but true co-creators in this meaningful forum for the exchange of knowledge and ideas.

Finally, this event would not have been possible without the steadfast support of our administration. I extend my sincere appreciation to the teams in finance, IT, and marketing for their dedication and professionalism. Your diligent efforts behind the scenes have provided the foundation upon which our academic community can confidently present its excellence. This symposium stands as a testament to the strength of our collective achievement. HIRS embodies the powerful synergy that emerges when talent, dedication, and collaboration unite. I encourage you to engage deeply with the research presented, foster meaningful connections, and draw inspiration from the wealth of ideas shared throughout this event.

Welcome to HIRS 2025.

**Mr. Saravanan Periyasamy**
**Chief Executive Officer**
HORIZON CAMPUS
Knowledge City Malabe,
KCM Drive, Off Millennium Drive,
Malabe, Sri Lanka

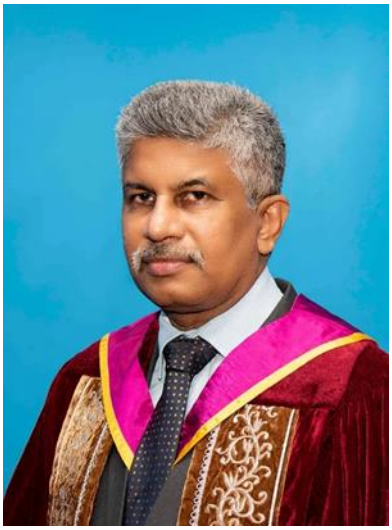
## A Message from the Dean of the Faculty of Technology

Research skills form the foundation of academic excellence. They help students gain an in-depth understanding of their subjects, enhance critical thinking and problem-solving abilities, and strengthen time management and teamwork skills. The Faculty of Technology places a strong emphasis on enhancing teaching and training efficiency through research and innovation. We believe that cultivating a genuine enthusiasm for research among students is essential to building a vibrant research culture within the institution. A key initiative in this effort is the Student Research Symposium, which serves as a platform for students to showcase their research findings, share knowledge, engage with peers and experts, and develop essential academic and professional skills. Our BBST students actively contribute through research on agricultural biotechnology, precision and smart agriculture, sustainable and climate-resilient farming systems, and the integration of traditional knowledge in bioresource management—areas that directly align with the SDGs and address global challenges in food security. Similarly, our Engineering Technology students from the B.Sc. and M.Sc. programs in Quantity Surveying (QS) and Construction Project Management also attend in impactful research focusing on sustainable construction, automation technologies, advanced construction materials, risk management, and safety in the global construction industry. We take great pride in the dedication of our students and extend our heartfelt appreciation to the faculty members for their continuous guidance, motivation, and commitment to fostering a strong research and innovation culture within our institution.

I wish good luck to all presenters!

**Prof. Lilaknath Obeyesekera,**
**Dean of the Faculty of Technology,**
HORIZON CAMPUS
Knowledge City Malabe, KCM Drive, Off Millennium Drive,
Malabe, Sri Lanka

## A message from the Dean of the Faculty of IT



It is very much heartening to note the number of research articles submitted by the researchers of different faculties, bringing forth the results of the unseen efforts and commitment of the academic community. Quality research is essential for a university to excel in its academic achievements. Not only the academics, but also the students need to engage in research activities in order to delve into the hidden treasures that are not yet discovered for the benefit of the society. A university without research is merely a selling point of educational objects, while a university that brings forth the research talent within its student and staff community would be a university that displays its true meaning and mission that gives life to the innovative ideas. For this to happen, staff-student engagement creatively and productively is essential. This research symposium showcases the results of such engagement, and it is the duty of the authorities to nurture it further and improve the current environment to a level that would provide a fertile research land that nourishes the budding young community to bring forth lasting fruits, which will in turn take the same university to further heights.

A big applause should be given to the organisers of the symposium, the editors, the mentors, and most importantly the research contributors, irrespective of whether their articles were selected or not for publication.

**Prof. Shantha Fernando**
*PhD, MPhil, MA, B.Sc.Eng.Hons., MIET(UK), MCS(SL), MIE(SL), C.Eng*
**Dean, Faculty of Information Technology**
HORIZON CAMPUS
Knowledge City Malabe, KCM Drive, Off Millennium Drive,
Malabe, Sri Lanka

## A message from the Dean, Faculty of Education

It is with great pleasure that I send this message to the Horizon Interdisciplinary Research Symposium 2025, conducted by Horizon Campus.

First of all, I would like to take this opportunity to bless the participants, as this symposium serves as a vital platform for showcasing the innovative research conducted by our students as well as other researchers.

The aim of this symposium is to provide an opportunity for the researchers to share and discuss findings to create new knowledge, enhance existing knowledge, and foster a collaborative environment for future work. I believe that this event will also provide many opportunities for the researchers not only to improve their essential skills such as presentation skills, critical thinking and other soft skills, but also for disseminating innovative solutions to pressing issues in different fields.

I would like to extend my sincere appreciation to the organizing committee for their hard work in making this symposium a reality. And I wish all participants that the symposium will be a highly productive and stimulating experience. May this symposium be a source of inspiration and lead fruitful discussions and new collaborations.

**Dr. Jayanthi Gunasekara**
**Dean – Faculty of Education**
HORIZON CAMPUS
Knowledge City Malabe, KCM Drive, Off Millennium Drive,
Malabe, Sri Lanka

## A message from the Dean of the Faculty of Management

It is with immense pleasure that I welcome you to this prestigious Research Symposium, a cornerstone event for fostering scholarly excellence within Horizon Campus. Research stands as the bedrock of academic pursuit, empowering faculty members to expand the frontiers of knowledge through rigorous investigation and undergraduates to develop essential skills in critical analysis, innovation, and real-world application, thereby preparing them for leadership in a dynamic global landscape.

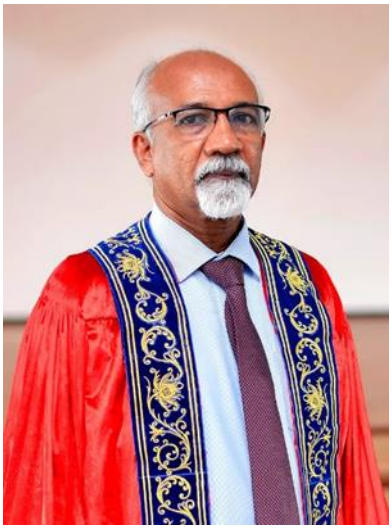
I extend my heartfelt gratitude to the Vice Chancellor for his steadfast leadership and endorsement, to the Campus Management for their invaluable support, and to the committed organizers whose meticulous planning and unwavering dedication have brought this symposium to fruition.

I encourage all attendees to participate actively in the enriching dialogues and celebrate the profound impact of research on our academic community.

Sincerely,

**Terence Kahapola Arachchi**
**Dean – Faculty of Management**
HORIZON CAMPUS
Knowledge City Malabe, KCM Drive, Off Millennium Drive,
Malabe, Sri Lanka

## A message from the Dean of the Faculty of Science



It is with great pleasure that I am sending this message on the occasion of the International Symposium HIRS – 2025, organized by the Horizon Campus, Malabe. By facilitating both virtual and in-person participation, HIRS has provided increased accessibility for a global audience.

As a multidisciplinary conference, HIRS provides a common platform for researchers from many subject areas to promote research collaboration needed to solve the complex problems of the present world. The HIRS-2025 gives the opportunity for participants to view and discuss the novel advances in their fields of interest and to interact with the leading scientists in the respective fields.

I wish to express my sincere gratitude to the organizing committee and the members of the Horizon campus for their untiring effort to make HIRS – 2025 a success. I wish all the participants and presenters the best of luck and productive experience in attending HIRS- 2025.

**Prof. Thilak Attanayaka**
**Dean – Faculty of Science**
HORIZON CAMPUS
Knowledge City Malabe, KCM Drive, Off Millennium Drive,
Malabe, Sri Lanka

## A message from the Conference Chair

It is both an honour and a personal privilege to welcome you to the Horizon Interdisciplinary Research Symposium (HIRS) 2025. Serving as your Conference Chair has been a labour of love, driven by a core passion: to unlock the research potential within our institution and create a significant platform for our students and academics to shine.

Our vision for HIRS extends beyond an academic gathering; we aim to create a dynamic bridge to the industry, ensuring our research findings resonate with and address real-world challenges. Seeing this come to life is immensely gratifying. An event of this scale is a collective achievement. My deepest gratitude goes to the academic staff and Deans, whose enthusiasm and dedication went far beyond their regular duties. A special thanks to the research supervisors who actively encouraged and guided their students; your mentorship is the foundation of this event's success.

I am profoundly thankful to our Vice Chancellor for his expert guidance, our Deputy Vice Chancellor for securing vital connections and budget, and our CEO for the unwavering support from the marketing and design teams. The active participation of our entire senior leadership underscores a powerful, shared commitment to fostering a vibrant research culture at Horizon. The support from our partner universities, particularly La Trobe, in promoting this symposium has been exemplary. Finally, I must applaud our passionate students, who immediately saw the value in this opportunity. To the presenters and the incredible team of student volunteers who took on extra responsibilities—this event would not be the same without your energy and commitment. Thank you all for believing in this vision.

**Chrishankar Janathanan**
BA (Hons) Business Administration (SPL) (UK) | MBA (UOM) | MCIM (UK) | MSLIM (SL) | Practicing marketer (SL) | Doctoral Candidate (UOK)
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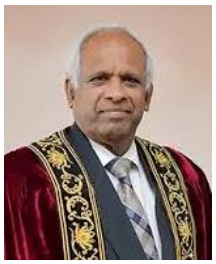

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# TABLE OF CONTENT

# ABSTRACTS

# A Survey on the Need for ESP (English for Specific Purposes) for Nurses in the Sri Lankan Healthcare Industry

Fernando, M.N.R., Ranasuriya, L.H.D.L.
*University of Vocational Technology, Sri Lanka.*

## Abstract

As Sri Lanka's healthcare sector becomes increasingly interconnected with international standards and practices, English language proficiency, such as written and verbal communicative proficiency, particularly in clinical and professional settings, has become a vital skill for nurses. However, many nurses are inadequately equipped with the specific language skills required in real-world healthcare environments, where they must apply the English language in practice. This research is guided by a key research question: What challenges do Sri Lankan nurses face related to English language requirements when they are transitioning from general English education into ESP in the industry? Using a mixed-method approach, the study collected data through 18 semi-structured interviews (two nurses from each province) by purposive sampling and 50 online survey responses through convenience sampling. The findings reveal recurring issues such as difficulty with medical terminology, clinical documentation, and patient interactions, particularly with foreign patients and international medical staff. Nurses reported that while they possess a foundational understanding of English, they struggle when it comes to using English in high-pressure or technical scenarios such as emergency communication, patient handovers, report writing, or explaining procedures and medications. Many expressed anxieties over making errors that could affect patients' safety or damage their professional credibility. These challenges are further compounded sometimes in rural hospitals, where nurses have fewer opportunities to practice English and limited access to professional development resources. The study also found that a lack of context-specific training and overreliance on general English programmes when enrolling into the nursing profession have left nurses unprepared for the linguistic realities of modern healthcare settings. Nurses proposed integrating ESP modules into nursing education, offering in-service training with real-case simulations, developing bilingual glossaries for common clinical terms, and involving experienced healthcare staff in designing ESP materials.

**Keywords**- *ESP (English for Specific Purposes), General English, Healthcare Industry, Language proficiency, Nurses.*

# Professional Development Needs of Mainstream Teachers in Supporting Inclusive Education for Autistic Learners in Sri Lanka's State Schools: A Contextual Analysis

Stanley Ranjithan, J.
Queen Margaret University, Edinburgh

## Abstract

There are several obstacles in the approach of implementing inclusive education in Sri Lanka's public schools, especially when it comes to meeting the educational requirements of students with autism. Many mainstream teachers lack the skills and confidence needed to effectively support these pupils, despite rules that promote inclusive practices. This study uses a contextual analysis based on Sri Lanka's socio-educational environment to investigate the professional development needs of mainstream educators. Using a qualitative methodology, the researcher gathered information from primary and secondary teachers in five state schools located in the districts of Colombo and Gampaha through semi-structured interviews. Teachers were purposefully selected to ensure a balance between primary and secondary levels and to represent varied teaching experiences. The interviews explored teachers' prior training, their classroom experiences with autistic students, and their views on inclusion. The data were recorded, transcribed, and thematically analysed, allowing the identification of common patterns, challenges, and suggestions from participants. This process provided both depth and contextual richness to the findings. Findings through the thematic analysis suggest that the insufficient initial training, limited ongoing professional development, ignorance of autism-specific strategies, attitudinal barriers, and systemic limitations like large class sizes and insufficient resource allocation were the five major drawbacks in the system. Moreover, teachers strongly indicated a high need for opportunities for peer cooperation, mentoring, and focused, hands-on training sessions that go beyond theory and address real classroom challenges. The significance of this study lies in its potential to strengthen the alignment between inclusive education policy and classroom practice in Sri Lanka. It provides concrete evidence on the gaps in teacher preparedness and highlights where professional development initiatives should be directed. By identifying teachers' specific needs, this research informs policymakers, curriculum developers, and training providers to design professional learning programs that are structured, culturally relevant, and adapted to the local context.

**Keywords***: Inclusive Education, Autism, Mainstream Teachers, Professional Development, Sri Lanka*

# Harnessing AI for Personalised Learning: Bridging Gaps in Underserved Education Systems

Stanley Ranjithan, J.
Queen Margaret University, Edinburgh

## Abstract

Education, like many other sectors, has been transformed by artificial intelligence (AI). In particular, AI-driven personalised learning has emerged as a promising approach to addressing persistent inequalities in underprivileged education systems. This study explores how AI can help close educational equity gaps by delivering adaptive, learner-centred experiences that cater to individual needs, especially in resource-limited settings. It highlights how AI can improve student engagement, learning outcomes, and access to quality education in underserved regions. Drawing on recent advancements in AI-enabled learning systems, this research examines case studies from developing nations where AI applications have demonstrated measurable improvements in student performance and retention. A mixed-method approach is employed, combining secondary data synthesis with qualitative content analysis to identify the key enablers and barriers to AI adoption in constrained educational contexts. Findings suggest that AI-powered tools—such as adaptive learning algorithms and intelligent tutoring systems—can mitigate challenges related to limited infrastructure and teacher shortages. However, the study also recognises critical challenges, including algorithmic bias, digital literacy gaps, infrastructure limitations, and ethical implications. Addressing these barriers is essential to ensure equitable and effective AI integration. The paper further discusses the importance of capacity building, cross-sector collaboration, and supportive policy frameworks in promoting inclusive AI-driven education. In conclusion, the study advocates for a multi-stakeholder approach to scaling AI-powered personalised learning in underprivileged areas. It recommends investment in digital infrastructure, teacher training, and ethical AI development to ensure that technological progress translates into educational equity. By emphasising the need for responsible and inclusive implementation, this research contributes to the growing body of evidence supporting AI's transformative potential in reimagining education for all.

***Keywords:*** *Artificial Intelligence, Personalised Learning, Underserved Education, Educational Technology, Learning Equity*

# Impact of the Pygmalion Effect on Enhancing Academic Performance among Grade 6 Students in an International School

Akmeemana, D. M.
*Faculty of Education, Horizon Campus, Malabe, Sri Lanka.*

## Abstract

This study examines the impact of the Pygmalion Effect on student performance, focusing on how teachers' positive attitudes and high expectations can enhance educational outcomes. The primary aim was to generate interest in professional development programs that train teachers to set high expectations and adopt supportive teaching practices through attitudinal change. The specific objectives were to: (a) examine evidence-based outcomes influenced by the Pygmalion Effect in educational settings, (b) identify strategies for teachers to improve student performance through high expectations, and (c) provide recommendations on the importance of professional development programs leveraging the Pygmalion Effect. This research falls under the category of Development Research and was conducted as an empirical investigation, incorporating both statistical evidence and structured survey methods. A quantitative research design was employed, following a deductive reasoning approach. The sample consisted of 41 students selected through stratified cluster sampling from Mathematics classes taught by the researcher in Grades 6A, 6B, and 4B at an international school in Ratmalana. Data collection involved: (a) surveys and structured questionnaires to assess teacher expectations and student perceptions, (b) classroom observations to examine student behaviours and reactions to teacher actions, and (c) academic performance records, including assessment and evaluation reports. The literature review identified key independent variables influencing student achievement, informing the implementation of classroom strategies based on the Pygmalion Effect. Findings indicate that higher teacher expectations, combined with constructive feedback and positive reinforcement, significantly contribute to student success. The results provide valuable insights for school management in designing professional development programs focusing on educational psychology, learning disabilities, and supportive teaching environments. By integrating expectation-based strategies into classroom practice, schools can foster improved academic outcomes and a more positive learning culture.

**Keywords:** *Pygmalion Effect, Self-fulfilling Prophecy, Empirical Study, Continuous Professional Development*

# Impact of Teacher Empowerment (Literacy Improvement) Program on Pedagogical Practice: Evidence from Trincomalee, Mullaitivu, and Kilinochchi Districts

Sabesan, N., Selvaranee, I.
*Faculty of Education, Horizon Campus, Malabe, Sri Lanka.*

## Abstract

This study examined the impact of a literacy-focused teacher empowerment program on pedagogical practices in Sri Lanka's Northern and Eastern provinces, specifically in the districts of Trincomalee, Mullaitivu, and Kilinochchi. Despite the program's broad implementation, variations remain in how teachers translate training into classroom practice. Using a descriptive mixed-methods approach, data were collected from 140 trained primary teachers through structured questionnaires, supplemented by interviews and group discussions with principals and In-Service Advisors (ISAs). Quantitative data were analyzed using SPSS (v. 31), employing descriptive statistics, correlation, and multiple regression to assess the relationships between training program, teacher-related factors, contextual school environment, implementation fidelity, and pedagogical outcomes. The training program alone explained 36.9% of the variance in pedagogical outcomes ($R^2 = .369$, $p < .001$), which increased to 71.9% ($R^2 = .719$, $p < .001$) when teacher-related, contextual, and implementation variables were included. Implementation fidelity showed the strongest predictive effect ($\beta = 1.054$, $p < .001$), confirming that consistent classroom application of learned strategies is critical for sustained pedagogical improvement. Teacher-related factors significantly mediated the impact of training ($\Delta R^2 = .113$, $p < .001$), while contextual and school environment factors demonstrated weak but supportive indirect effects ($\beta = .017$, $p = .797$). Although 93.6% of teachers reported incorporating learned strategies into lesson plans, only a few consistently applied them in practice. Principals also acknowledged weak follow-up and limited awareness of trained strategies. The study concludes that the teacher empowerment program has the potential to enhance pedagogical quality, but sustained success requires continuous professional support, monitoring, and strong leadership engagement. It recommends integrating structured follow-up mechanisms, peer collaboration, and school-based mentoring into training frameworks to ensure long-term pedagogical transformation.

**Keywords:** *Teacher Empowerment, Literacy Improvement, Pedagogical Practices, Implementation Fidelity, Professional Development, Sri Lanka*

# Improving Year 4 Students' Subject-Verb Agreement through Contextualised Strategies

Jayakody, C. H., Dahanayaka, G.
*Faculty of Education, Horizon Campus, Malabe, Sri Lanka*

## Abstract

This study examined the effectiveness of contextualized learning approaches in enhancing Year 4 students' mastery of subject-verb agreement (SVA) in the simple present tense within a Sri Lankan primary ESL context. SVA is fundamental to grammatical accuracy, affecting the clarity of written and spoken communication. Persistent SVA errors, particularly with third-person singular forms, undermine academic achievement and limit expressive ability. In Sri Lanka, this challenge is compounded by limited authentic language exposure outside classrooms, although grammar instruction is dominated by rule memorization and repetitive drills. Building on research emphasizing authentic contexts, gamification, and collaborative tasks suggested by Goh & Taib (2020), Hung (2021), and Alshammari (2022), this study implemented a three-phase intervention with five Year 4 students at Horizon College International, identified through pre-assessments for recurring SVA errors. The intervention consisted of: (1) visual scaffolding through Smart Board presentations and sentence-building exercises; (2) gamified grammar practice, including two digital drag-and-drop activities, an online quiz, and a physical 'Verb Hunting Race'; and (3) real-life role-play tasks simulating everyday scenarios. Data were collected through classroom observations, formative assessments, reflective journals, and student interviews over six weeks. Results demonstrated marked improvement in SVA accuracy (pre-test: 42% accuracy; post-test: 78% accuracy) and fluency, with learners exhibiting greater self-correction and confidence in independent tasks. Gamification increased motivation and reduced grammar anxiety, while role-play fostered natural grammar use in communication. Findings affirm the effectiveness of integrating contextualized, student-centered approaches into primary ESL grammar instruction. Recommendations include incorporating multimodal strategies into curricula and providing targeted teacher training to maximize instructional impact.

**Keywords:** *Subject-verb Agreement, Contextualized Learning, Gamification, Role-play, ESL Grammar Instruction*

# Awareness of Inclusive Education among Primary Education Teachers: Investigation and Proposing Strategies for Effective Implementation in Sri Lankan State Schools.

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## Abstract

Inclusive education is largely promoted in Sri Lankan policy but poorly practiced. The objective of this study was to investigate teachers' awareness of inclusive education and strategies for implementation in state primary schools. Employing a mixed-methods exploratory sequential design, 100 teachers from 10 randomly selected schools were surveyed by using a standardised questionnaire, followed by interviews with 10 principals and 20 parents. Only 20% of teachers showed adequate knowledge of inclusive education. Although the majority of views were positive, obstacles included training, resources, and institutional support. Principals emphasised a lack of direction and personnel, whereas parents described limited personalised assistance and ongoing dependence on segregated units. The findings concluded that inclusive education can become empty rhetoric without institutional teacher training, adequate resources, and effective school-level policy enforcement. Key suggestions were focused on professional development, team teaching at the grade level, and more robust zonal-level supervision. The study emphasises practical ways to eliminate Sri Lanka's policy–practice divide and cultivate inclusive school cultures.

**Keywords:** *Inclusive Education, Teacher Awareness, Primary Education, Sri Lanka, Implementation Strategies*

# Establishing Inclusive Education Effectively in Sri Lankan Classrooms

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## Abstract

This study examines the barriers to establishing inclusive education effectively in Sri Lankan classrooms and proposes actionable strategies for improvement. Employing a qualitative research design, data were collected through structured interviews with 25 teachers, 50 parents (including those with normally abled and differently abled children), 20 students, 10 principals, and educational administrators across six schools in the Western Province. Supplementary observations and analysis of Ministry of Education reports enriched the findings. Thematic analysis was used to identify patterns related to resources, teacher training, and attitudes. Key findings reveal systemic challenges, including inadequate physical infrastructure and teaching-learning materials, insufficient teacher training, and negative attitudes among untrained teachers and some parents. While teacher-student ratios were generally acceptable, the absence of specialized training and customized learning resources hindered effective inclusion. Competitive, exam-oriented classroom culture further marginalized students with disabilities. Recommendations include the provision of adequate physical resources and assistive technologies, the establishment of a national policy for comprehensive pre-service and in-service teacher training creation of resource centers for materials and professional support, the development of customized curricula guided by universal design principles, fostering community partnerships to strengthen support networks, and implementing awareness programs to shift societal attitudes toward inclusion. By addressing these interconnected barriers through policy reform, resource allocation, and stakeholder engagement, Sri Lanka can create equitable learning environments that uphold the principles of inclusive education.

**Keywords:** *Inclusive Education, Teacher Training, Resources, Curriculum Design and Implementation*

# An Analysis of the Impact of Social Factors on the Education of Secondary Level Students in Colombo District

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## Abstract

This mixed-methods study investigates the impact of parental education, family income, parental involvement, and peer influence on the education of secondary-level students in the Colombo District. A sequential explanatory design was employed with 245 students, 180 parents, and 32 teachers participating through stratified random sampling from 12 secondary schools. Quantitative data were collected via validated online surveys and analyzed using multiple regression analysis, while qualitative data from 24 semi-structured interviews underwent thematic analysis. Results revealed that parental education and parental involvement were the strongest predictors of academic achievement. Family income significantly influenced access to educational resources, while peer influence showed bidirectional effects. Students from higher socioeconomic backgrounds scored 23% higher on academic measures. The findings highlight the need for targeted interventions, including parental education programs, financial support mechanisms, and positive peer mentorship initiatives to reduce educational disparities and promote equitable learning opportunities across socioeconomic groups in the district.

***Keywords:*** *Parental Education, Family Income, Parental Involvement, Peer Influence, Educational Disparities*

# Impact of Structured Mentoring Programs on Newly Appointed Teacher Retention

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## Abstract

Teacher attrition remains a significant concern globally, with 30-50% of newly appointed teachers leaving within five years. This challenge is acute in Sri Lankan private schools due to limited induction support, inadequate guidance, and early career difficulties. Structured mentoring programs offer professional, emotional, and instructional support to address these challenges, yet empirical evidence of their effectiveness in Sri Lankan private school contexts remains limited. This mixed-methods research explores how structured mentoring influences teacher retention in three private schools within Kaluthara Zone. The sample comprised 30 newly appointed teachers with less than six months' experience and 5 senior mentors. Data were collected through structured surveys, semi-structured interviews, and school retention records. Quantitative analysis employed descriptive and inferential statistics, while qualitative data underwent thematic analysis. Findings revealed that formal mentoring significantly enhances retention and job satisfaction, with 83% of mentees reporting increased classroom management confidence and 76% expressing stronger commitment to remaining in their schools. Retention rates improved from 62% to 84% following program implementation; however, inconsistent mentor training, variable meeting frequencies, and high mentor workloads limited effectiveness. Recommendations include standardized mentor training, balanced mentor-mentee ratios, regular program monitoring, and institutional support addressing workload and salary concerns to create sustainable teacher support systems.

**Keywords:** *Teacher Retention, Mentoring Programs, Newly Appointed Teachers, Professional Development, Private Schools.*

# Factors Contributing to Teacher Burnout Among Grade 10 Science Teachers in International Schools in Colombo District, Sri Lanka

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## Abstract

The purpose of this study is to examine the major factors affecting teacher burnout: specifically, science teachers in grade ten in Colombo district in Sri Lanka's international schools. In this paper, we seek to identify the key institutional, psychological, and demographic predictors of burnout in this at-risk educational setting, given teacher retention issues and already existing mental health concerns around highly pressurized academic environments. A quantitative approach was used through distributing a structured questionnaire to 60 science teachers of international schools from 10 international schools. An analysis of four constructs was conducted for career satisfaction, perceived administrative support, workload control, and attitudes toward students. Descriptive and comparative statistical analyses were applied to the data collected in order to discover trends or correlations between teacher factors and levels of burnout. Key findings indicate that while most teachers reported moderate to high job satisfaction, many experienced significant stress related to workload and limited administrative support. Female and mid-career educators showed higher burnout levels compared to early-career and single teachers, who exhibited greater adaptability. Furthermore, inadequate mental health resources and unbalanced work distribution were found to intensify burnout symptoms. The study's implications emphasize the need for targeted interventions at the school and policy levels. Strengthening administrative support, promoting mental health awareness, and ensuring equitable workload distribution can enhance teacher resilience and retention. These insights provide a foundation for educational leaders to implement sustainable strategies that foster teacher well-being and prevent burnout in international school contexts.

**Keywords:** *Teacher Burnout, Teaching Science, Teacher Retention.*

# Investigating Challenges Faced by Western Classical Music Learners in Colombo District

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## Abstract

This research investigates the challenges faced by learners of Western classical music in the Colombo district, focusing on the educational barriers, socio-cultural factors, and institutional limitations that impact their learning experiences. The study employed a mixed-methods approach, combining qualitative interviews with music instructors and learners, along with quantitative surveys to gather a comprehensive understanding of the issues faced by the students. Key challenges identified include limited access to resources, a lack of trained instructors, societal perceptions of Western classical music, and financial constraints affecting both learners and institutions. The findings suggest that while there is a growing interest in Western classical music, obstacles continue to hinder its widespread adoption and quality learning. The research provides recommendations for educational policymakers and institutions to enhance the learning environment for Western classical music students, thereby fostering a more inclusive and accessible music education system in Colombo, which could be expanded nationwide later. This study contributes to the academic understanding of music education challenges in Sri Lanka and sets the stage for further exploration into improving the quality of music education in the region.

***Keywords:*** *Western Classical Music, Music Education, Challenges in Music Learning, Socio-Cultural Factors, Music Instructors and Resources.*

# Teacher Perspectives on The Effectiveness of Grade 5 English Language Curriculum of Sri Lanka: A Review of Literature

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## Abstract

There is a significant interest in evaluating the effectiveness of the English language curriculum in Sri Lanka, as it assists learners to achieve equitable education, social mobility, and various higher education opportunities. Grade 5 is a transitional period in primary school education, a substantial shift from basic language knowledge to higher levels to meet the demands of horizontal integration with secondary knowledge levels. As a part of a larger study that focuses on the effectiveness of Grade 5 English language curriculum implementation, this paper synthesises the literature on teachers' voices in relation to curriculum implementation, focusing on the development of language proficiency, thinking, and communicative competence among students. The sources include empirical studies, government reports, and peer-reviewed articles that examine teachers' experiences, instructional approaches, and systemic factors affecting curriculum implementation. The review of literature emphasises learner-centered approaches, such as activity-based and literature-informed teaching, as methods to enhance student involvement, vocabulary development, reading fluency, and expressive writing. Despite these pedagogical advantages, impediments evidently emerge, which highlight the top-down curriculum design, disparities in resources, minimal teacher training and professional development, and structural limitations such as a lack of scaffolding support for self-directedness and variations in bilingual education. It is suggested that the key role of teachers in transferring curriculum goals to classroom teaching is impacted by their knowledge, attitudes, and professional development. Known strategies to increase the effectiveness of the curriculum include collaborative learning, reflective practices, and localisation of content.

***Keywords:*** *Grade 5 English, Sri Lanka, Curriculum Effectiveness, Teacher Perspectives, Pedagogy*

# Comparing the Impact of Digital Gamification and Traditional Methods on Primary Mathematics Homework Completion: A Study in Sri Lankan Schools

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## Abstract

This study examines the comparative effects of gamified digital homework platforms and traditional paper- based homework on primary mathematics learning in Sri Lanka, focusing on Key Stage 2 students. The research evaluates teacher workload, feedback quality, student engagement, and homework completion rates. A total of 200 students (100 Grade 3 and 100 Grade 4) and 20 teachers from ten schools across five provinces participated in this mixed-methods study conducted over six weeks. Data were collected through homework completion logs, accuracy records, time-on-task measurements, surveys, and semi-structured teacher interviews. Quantitative analysis employed descriptive statistics and independent t-tests, while qualitative data underwent thematic analysis. Findings indicate that gamified digital homework significantly improves student engagement and consistency in completing assignments, provides faster and more personalized feedback, and reduces teacher workload compared to traditional methods. Completion rates improved from 67% in traditional homework methods to 89% under gamified conditions, and average accuracy increased from 71% to 82%. Time-on-task decreased from 18.7 minutes to 14.3 minutes per worksheet. Challenges included restricted access to digital devices in rural settings, teacher training requirements, and potential overuse of extrinsic incentives. These results provide practical guidance for educators and policymakers regarding the integration of gamified digital homework in primary mathematics classrooms, offering empirical evidence supporting informed decisions about homework strategies that enhance learning outcomes while optimizing teacher workload.

**Keywords:** *Gamification, Digital Homework, Primary Mathematics, Student Engagement, Teacher*

# Investigating Career Opportunities through Biosystems Technology Subject Stream among Graduates in Horana Educational Zone

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## Abstract

The Biosystems Technology (BST) stream was introduced into Sri Lanka's A/L curriculum in 2013 with the purpose of filling the gap between theoretical science education and agriculture and technology-practical knowledge. This study carried out an examination of the career pathways among 2015–2017 BST graduate cohorts in Horana Educational Zone. Using a descriptive survey and stratified sample, 60 respondents were gathered to study employment types, post-school education, and duration to achieve first employment. The outcomes illustrate a complex relationship between government recruitment, market demand, and curriculum applicability. Typically, findings indicate that the career trajectories of BST graduates are mixed, and they are largely influenced by state hiring policies, the business cycle, and institutional interventions. Whereas government work dominated early cohorts, prospects had declined by 2017, with rising times to place and the shift to the private sector and self-employment. Self-employment was highest in 2016 due to policy support and entrepreneurship curriculum modules, but lacked sustained support. Statistical tests such as One-Way ANOVA and Tukey HSD revealed significant differences in placement time across the cohorts, and the 2015 cohort secured jobs the quickest. Discussion turns to aligning the curriculum with industry needs, ensuring consistent recruitment, and promoting entrepreneurship support. It is concluded from this research that although BST is a flexible career option, it is strongly influenced by economic conditions, government policies, and institutional support. In order to achieve maximum effect, the study recommends constant updating of the curriculum, stronger industry-education relationships, and constant encouragement of student entrepreneurs.

**Keywords:** *Biosystems Technology, Career Opportunities, Job Placement*

# Impact of Sinhala/English Code-Switching in Advertisements on Sinhala Monolingual Consumers

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## Abstract

Media plays a key role in today's fast-moving world, and especially in the fields of advertising. Due to the rising markets and the mounting competition among products, it is observed that advertisements are very much in demand, and of all the media, television advertising plays a key role. Due to the market competition, advertisers incorporate various techniques to promote their brands, and television advertising engages many strategies to grab the audience, such as visuals, songs, and creative use of language. Code Switching (CS) is one such strategy used in many television advertisements to grab the audience. Although CS is innovatively used, advertisers are not fully aware of the perceptions of the viewer towards the use of CS in advertisements. Hence, the current study explored the perceptions of monolingual viewers on the use of CS and its impact. The sample was viewers whose first language was Sinhala. A mixed-method research design was incorporated, including qualitative (interviews) and quantitative (questionnaires) data collection tools. The sampling technique used was purposive sampling, and it was selected from Colombo, Kandy, and Galle, which are three provinces listed as the largest television viewing groups as per secondary data. 60 participants from each age group were selected, and 20 follow-up interviews were carried out with each age group until it reached the point of data saturation. The findings revealed that views on CS varied across age groups. While most youth preferred CS in advertisements, the older viewers were more negative towards the inclusion. The older age group was of the view that CS was used by those who were not fluent in English, or just as a trend. Monolinguals were more critical of the use of CS due to their lack of English language proficiency, which hindered their comprehension. The study suggests that advertisers should consider viewer comprehension while using CS as a trend.

**Keywords:** *Bilingual Viewer, Code Switching, Monolingual viewer, Perceptions, Television Advertising*

# Challenges in English Medium Instruction in Tertiary Education: A Review of Pertinent Literature

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**Abstract**

English Medium Instruction (EMI) is becoming increasingly popular in the higher education sector, mainly driven by globalization, internationalization policies, and the globally recognized socio-economic value of English. As part of a larger research project, this review explored empirical research conducted between 2010 and 2025 to understand the challenges encountered by instructors and students in EMI undergraduate contexts, focusing on Asian and Sri Lankan contexts. A qualitative desk-based approach was utilized to analyze the sources to identify challenges related to linguistic, pedagogical, cultural, and institutional barriers. Results indicate that instructors face challenges mostly when delivering academic content and expressing complex ideas, which causes them to frequently rely on code-switching. Furthermore, it was reported that the primary reason for these challenges was poor English proficiency, and it was recommended that both instructors and students improve their English proficiency to a sufficient level. However, more recent studies emphasize the need for innovative bilingual strategies, peer-supported teaching, and adaptive approaches to maintain classroom engagement and enhance comprehension. It was also reported that students mainly encounter poor proficiency in speaking and reading, which causes poor understanding and participation in EMI classrooms. In conclusion, the causes for EMI challenges have evolved from linguistic issues to more complex pedagogical and structural concerns over time. The study provides insights into real-life usage of EMI and offers practical recommendations to enhance academic outcomes in undergraduate education in Sri Lanka and other Asian countries.

**Keywords:** *English Medium Instruction (EMI), Higher Education, Instructors, Students*

# AI Framework for Predicting Student Comprehension in Online Learning: Lecturer Perspectives

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## Abstract

Artificial Intelligence (AI) has become a transformative force in higher education, particularly in addressing the challenge of assessing and supporting student comprehension within online learning environments. This study examines university lecturers' perspectives on the pedagogical potential and ethical implications of AI-driven frameworks designed for real-time comprehension prediction. Drawing on data collected through a structured questionnaire distributed to Sri Lankan lecturers with varied online teaching experience, the research integrates qualitative insights. Findings indicate that lecturers demonstrate a strong appreciation for the pedagogical value of AI-based systems, especially those that facilitate adaptive and data-informed teaching. Most respondents viewed real-time feedback and behavioral analysis tools as effective mechanisms to enhance engagement and instructional responsiveness. This optimism reflects a growing readiness among educators to integrate AI into their online pedagogical practice, provided such systems align with educational objectives and institutional capacity. Simultaneously, ethical considerations emerged as a defining concern. The study recognises that while lecturers recognize AI's potential to strengthen online teaching through real-time comprehension prediction, their support is contingent upon clear ethical safeguards and institutional accountability. It recommends that universities develop policy frameworks that prioritize informed consent, privacy protection, and equitable access, alongside targeted capacity-building initiatives. Balancing technological innovation with ethical responsibility will be essential for AI to serve as a genuine pedagogical ally in higher education.

**Keywords:** *Artificial Intelligence in Education, Comprehension Prediction, Lecturer Perceptions, Online Learning, Sri Lankan Higher Education*

# Factors Affecting Students' Disinterest in Government A/L Classes: A Study on Students Shifting to Private Tuition in Western Province, Sri Lanka

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## Abstract

This survey–based research study investigated whether there is a decline in attendance among upper secondary students (aged 17 to 19) in government school A/L classes (2025 batch) and identified the key factors contributing to this trend, alongside the increasing preference for private education in the Western Province of Sri Lanka. The main objectives of this study were to ascertain the factors that can promote the shifting to private education, and to investigate how academic aspirations, peer pressure, and social expectations influence students' transfer towards tuition-based education. This study primarily adopted a quantitative research design utilizing a structured five-point Likert scale questionnaire distributed via Google Forms. The questionnaire was developed on three key factors as independent variables identified through the literature review: teaching quality of government school A/L classes, preference for private education, and parental & social influences shifting toward private tuition classes. A stratified random sampling technique was employed to select 300 respondents from the Western province. The key findings highlighted the lack of quality teaching, low time productivity in school classes, socio-economic influences that push students towards private education, and the greater freedom and flexibility offered in tuition classes. The research findings raised a red alarm for the free education system in Sri Lanka, highlighting a growing disinterest in A/L education in government schools and a strong preference for private A/L educational institutes.

**Keywords:** *Government Schools, Free Education Policy, G.C.E. Advanced Level (A/L), Student Attendance, Private Tuition Classes.*

# Exploring Grade 10 Students' Reluctance in Group Activities during Buddhism Lessons

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## Abstract

This study examines the reluctance of Grade 10 students in Sri Lankan schools to engage in group activities during Buddhism lessons. Although the national curriculum promotes collaborative learning, classrooms often remain teacher-centered. A mixed-methods approach was adopted in collecting data in three secondary schools, combining tools such as questionnaires, semi-structured interviews, and classroom observations. Quantitative data revealed student attitudes and preferences, while qualitative analysis identified emotional and cultural barriers in participation. Findings show that reluctance stems from three interconnected factors. First, emotionally insecure students feared peer judgment, lacked confidence, and avoided speaking in groups. Second, instructional gaps— teachers, constrained by syllabus demands and lacking facilitation training, conducted unstructured activities that reinforced passive learning. Third, cultural influences, hierarchical norms, and gender expectations limited equitable participation, particularly for female students. The study recommends professional development in cooperative learning methods, structuring group roles to promote inclusion, and fostering emotionally safe classrooms. These strategies can bridge the gap between curriculum intentions and practice, enabling group activities to achieve their intended role in nurturing Buddhist values such as compassion, respect, and ethical awareness. By addressing psychological, pedagogical, and cultural challenges, this research contributes to improving value-based education in Sri Lanka and offers insights relevant to broader educational reforms.

**Keywords***: Group Learning, Student Participation, Buddhism Education, Emotional Safety, Pedagogy*

# Determination of Motivational Factors Affecting Students' School Attendance in G.C.E A/L Physics Class (A Concept Paper)

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## Abstract

Student attendance is a critical factor influencing academic achievement, particularly in a subject like Physics at the General Certificate of Education Advanced Level (G.C.E. A/L), where continuous engagement is essential for conceptual understanding and practical application. Despite its importance, especially for students pursuing STEM careers, Physics classes at the A/L level often suffer from inconsistent attendance. This study investigates the motivational factors affecting students' attendance in A/L Physics classes within the Kelaniya Educational Zone in Sri Lanka. Using an adapted version of the School Refusal Assessment Scale (SRAS), the study measures four motivational dimensions: avoidance of negative affectivity, escape from social evaluation, attention-seeking, and pursuit of tangible rewards. A quantitative, descriptive research design was employed, targeting a stratified random sample of 300 students from 1AB government schools. The SRAS was translated into Sinhala and back-translated to English using a blind translation process involving language experts, with verification by subject specialists. A pilot test was conducted with five students to validate the adapted instrument. Data will be analyzed using descriptive and inferential statistics, including correlation, ANOVA, and regression analysis. The findings aim to inform evidence-based strategies for improving attendance and student engagement in Physics education.

**Keywords:** *Motivational Factors, School Attendance, Physics Education, SRAS, Stratified Random Sampling*

# The Impact of Government Language Policies on English Education in Sri Lanka

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## Abstract

This study examines the impact of government language policies on English education in Sri Lanka, tracing developments from the colonial period to the present. It aims to (1) identify the key characteristics of major policy changes, (2) assess their impact on English language teaching and learning, and (3) evaluate the implications of current policies. Using qualitative document analysis of 30 academic publications, five government reports, and interviews with ten senior English teachers, the study highlights how the 1956 Sinhala Only Act and subsequent constitutional amendments reduced English's prominence in education. Despite recent bilingual education initiatives, challenges such as insufficient teacher training and limited access persist. Comparative insights from Singapore reveal the importance of consistent policy direction and teacher capacity building. The paper concludes with recommendations for strengthening the English language policy to promote equitable and globally competitive education in Sri Lanka.

**Keywords:** *English Education, Language Policy, Bilingual Education, Sri Lanka*

# The Importance of Multimedia Projector Usage in Geography Teaching: A Computer-Assisted Learning Approach

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## Abstract

This study examines the role and effectiveness of computer-assisted presentations, specifically multimedia projectors, in enhancing the teaching and learning of geography at Musaeus College, Colombo 07, Sri Lanka. Employing a quantitative research methodology, data were collected through structured questionnaires administered to two groups: 15 prospective geography teachers enrolled in a teaching course and 50 secondary-level students currently studying geography. The aim was to evaluate their attitudes toward the integration of multimedia technology in geography instruction and to assess its contribution to the teaching-learning process. The findings reveal that the use of computer-assisted presentations positively influences students' understanding of geography by transforming abstract and complex concepts into more concrete and accessible forms. Students reported that multimedia presentations helped them visualize geographical phenomena more effectively, which enhanced their motivation and engagement in lessons. Prospective teachers also acknowledged that such technology aids in organizing and delivering content more clearly and appealingly, thus improving their instructional effectiveness. Geography, as a subject, often requires practical learning through excursions and field observations to fully grasp many topics. However, logistical and resource constraints frequently limit such opportunities, confining teaching largely to classroom settings. Additionally, challenges such as the transportation and handling of physical teaching materials further hinder the instructional process. Multimedia projectors offer a practical solution to these issues by enabling teachers to bring diverse geographical content into the classroom through digital means, including computer programs and internet resources. Overall, this study highlights the significant potential of computer-assisted technology to enrich geography education.

**Keywords:** *Multimedia Projectors, Technology in Teaching, Geography Teaching*

# An Investigative Study on Information-Searching Skills of Undergraduate Students from a Non-State Degree Awarding Institution

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## Abstract

The ability to locate, evaluate, and use information effectively is a core competency for academic success and lifelong learning. This study examines the information-searching skills of first-year undergraduate students at Horizon Campus, a non-state degree-awarding institution in Sri Lanka. It aims to assess students' existing library and information literacy (IL) skills, identify gaps in their information-searching behavior, and propose strategies to strengthen their learning support. Understanding these competencies is crucial for academic libraries seeking to develop evidence-based IL programs aligned with institutional needs. A quantitative, descriptive survey design was employed, and data were collected through an online questionnaire distributed to a population of 190 first-year students from diverse educational backgrounds. A total of 94 valid responses were analyzed using descriptive statistics to examine patterns of library use, preferred information sources, and challenges encountered in the search process. Among the respondents (n=94), most students are motivated to use the library mainly by lecturers (49%), followed by librarians (29%), while only a few are self-motivated. Books remain the most preferred information source (72%), with limited use of journals and other scholarly materials. A majority of students (82%) rely on both print and electronic formats, and most access information primarily through title and subject research. These results highlight students' limited independent search skills and the need for targeted support. The study recommends enhancing information literacy training, integrating IL into the curriculum, and conducting regular workshops to improve search and evaluation skills. Strengthening collaboration between lecturers and librarians can further promote effective and independent use of library resources.

**Key words:** *Information Literacy, Information Searching, Library Instruction, Undergraduate Students, Academic Libraries*

# Improving Student Interest in Science through Innovative Teaching Strategies

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## Abstract

This action research addresses science disengagement among Grade 7 students in Sri Lanka. The study focused on one persistently disengaged student at a specific international school who exhibited low participation, incomplete assignments, and negative attitudes toward science despite better performance in other subjects. Using Kurt Lewin's Action Research Model, two intervention rounds incorporated hands-on experiments, digital simulations, inquiry-based learning, gamification, and project-based activities. Data were collected through classroom observations, semi-structured interviews with the student, class teacher, and parent, alongside analysis of science notebooks and reflective journals. Results demonstrated significant improvements in classroom engagement, task completion, scientific vocabulary use, collaborative behavior, and confidence. The student progressed from avoidance to active participation, successfully presenting a science model and demonstrating leadership in group activities. Findings confirm that differentiated, interactive, and student-centered strategies effectively transform attitudes toward science, particularly for learners who perceive the subject as irrelevant or difficult. Recommendations include embedding hands-on activities, technology-enhanced learning, and inquiry-based methods into regular science instruction to sustain motivation and foster deeper conceptual understanding among all students.

**Keywords:** *Innovative Teaching Strategies, Student Engagement, Science Education, Action Research, Active Learning*

# Data-Driven Management System for Supermarkets: Forecasting Profit, Demand, and Customer Loyalty

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**Abstract**

The retail industry is highly competitive, and supermarkets in particular, face major challenges in financial planning, customer retention, and inventory management. To remain competitive, businesses can no longer rely solely on traditional reporting methods; they require predictive, data-driven strategies that support smarter decision-making and future planning. This study introduces a Smart Supermarket Management System that leverages machine learning to convert transactional data into actionable insights. The system focuses on three core problems: predicting future profitability, identifying potential loyalty program members, and forecasting product demand. To address these objectives, multiple models were implemented. A Gradient Boosting Regressor predicted profits with high accuracy, achieving an $R^2$ value of 0.8866. An enhanced Logistic Regression model identified potential loyalty members with 55.2% accuracy and 54.4% precision, enabling more targeted marketing. Finally, a time-series trend analysis forecasted product demand, distinguishing consistently high-selling items from those with rising sales trends. Overall, this integrated system provides a practical, data-driven solution for supermarket management empowering decision-makers to optimize inventory, enhance financial planning, and strengthen competitive advantage in the retail market.

**Keywords:** *Machine Learning, Customer Loyalty, Profit Prediction, Random Forest, Logistic Regression*

# A System for Machine Learning-Based Malware Detection

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**Abstract**

The increasing sophistication of modern malware poses a significant challenge to traditional signature-based detection systems, which often fail to recognize newly emerging or polymorphic malware. This study proposes a machine learning-based malware detection framework that leverages static features from executable files to identify both known and unseen threats. Using a dataset of 100,000 Windows Portable Executable (PE) samples, three classifiers: Random Forest, Logistic Regression, and Decision Tree were evaluated based on accuracy, precision, recall, and F1-Score. The Random Forest classifier achieved the highest accuracy of 98.2%, outperforming other models. A feature importance analysis revealed that API call frequencies, section entropy, and header metadata are critical indicators of malicious behavior. The findings demonstrate the potential of machine learning to enhance Cybersecurity defenses, offering a scalable, adaptive, and effective approach to detect malware in real-world computing environments. This framework can be further extended to incorporate hybrid analysis methods and deep learning models for improved robustness and resilience against emerging threats.

**Keywords:** *Malware Detection, Machine Learning, Random Forest, Cybersecurity, Feature Importance*

# Predicting Diabetes through Health Data Using Machine Learning and Streamlit Deployment

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**Abstract**

Diabetes mellitus is a chronic non-communicable disease with a rapidly growing global prevalence, especially in developing countries. In Sri Lanka, nearly one in five adults is affected, leading to major complications such as cardiovascular disease, kidney failure, and blindness. Early and accurate prediction is essential to reduce complications, improve quality of life, and minimize healthcare costs. Traditional diagnostic approaches are often invasive, time-consuming, and expensive, highlighting the need for scalable data-driven alternatives. This study explores the application of machine learning (ML) techniques to predict diabetes using the Pima Indians Diabetes dataset, which contains 768 patient records and eight clinical features. Comprehensive preprocessing steps, including missing value imputation, outlier handling, and feature scaling, were implemented to ensure data quality. Five supervised ML models: Logistic Regression, Decision Tree, Random Forest, k- Nearest Neighbors (k-NN), and Support Vector Machine (SVM) were trained and optimized using hyperparameter tuning with ROC–AUC as the primary metric. Among all tested algorithms, Random Forest achieved the highest performance with an accuracy of 80% and a ROC–AUC of 0.84, outperforming traditional classifiers. Feature importance analysis identified glucose, BMI, and age as the most influential predictors, consistent with established clinical evidence. To enhance accessibility and real-world usability, the best-performing model was deployed as a Streamlit web application, offering an interactive and user-friendly platform for real-time diabetes risk assessment. The significance of this research lies in providing an end- to-end, reproducible, and interpretable ML pipeline that bridges the gap between predictive modeling and practical healthcare deployment. By integrating robust ML methods with a deployable web interface, this study contributes to preventive healthcare by empowering clinicians and communities with a cost-effective, scalable tool for early diabetes detection.

**Keywords:** *Diabetes prediction; machine learning; Random Forest; Streamlit; healthcare analytics.*

# A Predictive Model through Machine Learning to Identify Sri Lankan School Students at Academic Risk

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**Abstract**

Educational achievement in Sri Lanka is largely determined by high-stake national examinations such as the Ordinary Level (O/L) and Advanced Level (A/L), which act as gateways to higher education and employment opportunities. However, many students face persistent challenges such as absenteeism, lack of study resources, and socioeconomic disadvantages. These factors are not usually identified early, as traditional evaluations depend heavily on final examinations. This study addresses the issue by developing a predictive framework using machine learning (ML) to detect students at risk of underperformance in Sri Lankan secondary schools. The widely used UCI Student Performance dataset was employed as the primary source and was contextually adapted with synthetic features such as parental education, region, and economic status to better reflect Sri Lankan realities. After preprocessing and augmentation, the dataset included approximately 1,000 student records. Four supervised ML algorithms Logistic Regression, Decision Tree, Random Forest, and Gradient Boosting were implemented using a Python-based pipeline. Data preprocessing involved handling missing values, encoding categorical variables, and feature engineering. Model performance was evaluated with standard metrics: accuracy, precision, recall, F1-score, and ROC-AUC. The results showed that ensemble methods, especially Random Forest (91.7%) and Gradient Boosting (92.1%), delivered the highest predictive accuracy while maintaining balanced precision–recall trade-offs. Logistic Regression and Decision Trees, although less accurate, offered interpretability that can assist educators in understanding key influencing factors. Feature importance analysis confirmed that midterm grades, attendance, parental education, and socioeconomic status were the most significant predictors of academic performance. The development of a Streamlit-based prototype further demonstrated the feasibility of real-time, user-friendly deployment. By integrating perspectives from computer science, education, and social sciences, this study contributes both a practical tool for local schools and new insights to the field of educational data mining in developing contexts.

**Keywords:** *Academic risk prediction, Machine learning, Streamlit, Random Forest, Student performance*

# A Machine Learning-Based System for Rainfall Prediction to Assist Decentralized Hydropower in Sri Lanka

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**Abstract**

Hydropower has long been a cornerstone of Sri Lanka's electricity supply, meeting 35–50% of national demand. Its renewable and cost-effective nature makes it useful, yet the sector is highly vulnerable to rainfall variability, which is intensifying with climate change. During the 2016-2017 drought, reservoir levels dropped sharply, forcing the Ceylon Electricity Board (CEB) to increase thermal generation by over 40%. This reliance on imported fossil fuels raised costs and weakened sustainability. Conversely, excessive rainfall and flooding have caused operational difficulties and spillovers in major dams. Despite its potential, decentralized rainwater harvesting remains underutilized as an energy resource, especially in rural communities. This research develops a machine learning-driven framework integrating rainfall forecasting, hydroelectric scheduling, and decentralized rainwater harvesting. Historical rainfall data from the Department of Meteorology, hydropower inflows from the CEB, and IPCC CMIP6 climate projections were used to train models including Long Short-Term Memory (LSTM), Random Forest (RF), ARIMA, and ensemble methods. Preprocessing steps such as imputation, normalization, and climate index integration improved accuracy. The ensemble model achieved $R^2$ = 0.93, effectively capturing both seasonal cycles and extreme events. Optimization using predicted inflows improved hydropower efficiency by 8% and reduced spillover by 12%. Reinforcement learning enabled adaptive turbine scheduling during droughts, protecting reservoir sustainability and irrigation capacity. At the community level, decentralized rainwater harvesting with micro-hydro and storage increased rural energy availability by 30% and cut diesel use by 45%, resulting in household savings of about LKR 75000.OO annually. The findings demonstrate that predictive analytics can transform Sri Lanka's energy planning from reactive to proactive. The proposed framework strengthens national energy security while empowering rural communities, aligning with Sustainable Development Goals (SDG 7: Affordable and Clean Energy, SDG 13: Climate Action).

**Keywords:** *Rainfall forecasting, hydropower optimization, machine learning, decentralized energy, Sri Lanka*

# Machine Learning Algorithms Integrated Classification System to Predict Oral Cancer Leveraging Early Diagnosis

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**Abstract**

Oral cancer remains a major global public health challenge, with prognosis highly dependent on early detection. Conventional diagnostic approaches such as imaging and biopsies are invasive, costly, and often inaccessible in low-resource settings, leading to delayed diagnosis and poor outcomes. This study addresses the limitations of existing prediction models by developing high-performance machine learning (ML) classifiers using high-quality demographic, lifestyle, and clinical data. The dataset included key variables such as age, gender, tobacco and alcohol consumption, betel quid chewing, family history, and lesion type. Data preprocessing involved median and mode imputation, duplicate removal, and class rebalancing using SMOTE and Borderline-SMOTE. Five supervised models; Logistic Regression, Random Forest, Gradient Boosting, Support Vector Machine (SVM), and k-Nearest Neighbors (k-NN), were trained via 5-fold cross-validation and evaluated using accuracy, precision, recall, F1-score, AUROC, and AUPRC. The Random Forest and Gradient Boosting models achieved the highest performance (accuracy = 0.9989, precision = 0.9977, F1 = 0.9989), outperforming other classifiers. SHAP analysis identified tobacco use, alcohol consumption, betel quid chewing, and family history as the strongest predictors. These results highlight the feasibility of cost- efficient, interpretable, and clinically viable ML-based decision-support systems for early oral cancer detection. Future work will extend model validation to larger and multimodal clinical datasets to enhance scalability and generalizability.

**Keywords:** *Machine Learning; Oral Cancer Prediction; Early Diagnosis; Random Forest; Gradient Boosting; SHAP Explainability; SMOTE*

# Phishing Link Detection Using Machine Learning: Browser Extension-Based Real-Time Protection

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**Abstract**

Phishing attacks, a pervasive and evolving cybersecurity threat, continue to bypass traditional blacklist-based defenses due to their reactive nature. This limitation creates a window of vulnerability that allows emerging time-aware phishing campaigns to remain undetected. This research presents a proactive and accurate machine learning (ML) framework for real-time phishing detection, integrated into a client-side browser extension. The proposed system operates entirely on the user's local device, ensuring instant protection and complete privacy without any reliance on external network requests or server-side analysis. A comprehensive dataset of over 100,000 URLs was collected from trusted public sources, including PhishTank for verified phishing links and the Common Crawl corpus for legitimate URLs. After cleaning, balancing, and deduplication, the final dataset comprised 85,000 samples with 23 engineered features categorized into lexical, domain-based, and HTML-based attributes. Among the evaluated algorithms were Decision Tree, Support Vector Machine, and Random Forest. The Random Forest model achieved 98.7% accuracy, 98.9% precision, 98.5% recall, an F1-score of 98.7%, and an AUC of 0.99. This high-performing model was deployed within a lightweight Chrome extension, ensuring real-time analysis with an average latency below 150 milliseconds. The results demonstrate that the proposed approach provides strong performance and practical viability compared to existing reactive methods, offering a privacy preserving and efficient defense mechanism for end users.

**Keywords:** *Phishing Detection, Machine Learning, Cybersecurity, Browser Extension, Random Forest.*

# A Web-Based Salary Prediction System for Job Roles in Data Science, AI, and Machine Learning

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**Abstract**

This research presents a web-based salary prediction tool for Data Science, AI, and ML roles. Using a public 2025 Kaggle dataset with job attributes (title, experience level, employment type, company type), features are cleaned and encoded, K-Means is applied to group salary bands, and PCA is used for structure-revealing projections. A Random Forest regressor serves as the predictor, achieving strong performance ($R^2 \approx 0.89$; low MAE), and is deployed via Streamlit for real-time use. The system supports salary transparency and HR analytics by providing individualized estimates conditioned on role and experience. The pipeline is outlined, predictive results and visual insights are summarized (histograms, boxplots, PCA), and deployment considerations are discussed. The tool can aid job seekers and employers in evidence-based decision-making and can be extended with skills/education features and multi-currency support.

**Keywords:** *Salary Prediction, Random Forest, PCA, Clustering, Machine Learning, Streamlit*

# A Mobile-Based Android Assistive Application and a Web Portal to Enhance Cognitive, Social, and Life Skills for Children with Neurodiversity

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**Abstract**

Neurodiversity emphasizes the acceptance of differences in cognitive functioning, including autism spectrum disorder (ASD), ADHD, and learning difficulties. This study focuses on designing a mobile-based assistive application and web portal to enhance cognitive, social, and life skills of children aged 3–10 with ASD. A systematic literature review revealed that autistic children often face difficulties with executive functioning, communication, memory, and social interaction. Previous mobile learning solutions have shown promise but lacked inclusivity, customization, and long-term evaluation. Our approach integrates a user-centered design grounded in cognitive development theories, incorporating interactive modules, gamification, and adaptive learning. Screen-time management strategies (10–15 minutes per session) are emphasized to balance technology with real-life interactions. The proposed solution not only addresses gaps in accessibility and cultural adaptability but also leverages machine learning, specifically clustering techniques, to provide personalized interventions. This initiative contributes to inclusive education and improved quality of life for neurodiverse children and their families.

**Keywords:** *Neurodiversity, Autism Spectrum Disorder, Assistive Technology, Mobile Learning, Cognitive Skills*

# A Framework for Secure Ownership Verification and Tamper Detection Using AI-Powered Watermarking

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**Abstract**

The growth of digital media has intensified challenges of copyright infringement, tampering, and disputed ownership. Conventional methods such as hashing, signatures, and traditional watermarking provide only partial protection, often failing under compression, cropping, or format conversion, and relying on centralized systems that limit scalability. This study proposes a conceptual framework for secure ownership verification and tamper detection using AI- powered invisible watermarking. By embedding imperceptible markers into images, videos, and documents through deep learning models, the system enables resilient verification without requiring the original file. It further incorporates real- time tamper detection and visualization to flag altered regions, while securing ownership through cryptographic signatures and metadata rather than storing actual media. Designed as a cloud-native, cross-platform solution is accessible via web and mobile interfaces while the framework ensures scalability and can be extended to blockchain integration for immutable ownership records. By combining invisible watermarking with adaptive AI techniques, it addresses persistent gaps in robustness, cross-format applicability, and verification transparency, offering a practical and secure foundation that strengthens digital trust and protects creators' rights.

**Keywords:** *Digital watermarking, ownership verification, tamper detection, artificial intelligence, content authenticity*

# AI Powered, Location Based Platform for Smart Job and Service Matching

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**Abstract**

This abstract outlines the design of an AI-powered, location-based mobile app aimed at transforming job and service matching in Sri Lanka. In many developing contexts, recruitment remains informal—relying on word-of-mouth, WhatsApp, social media, or manual ads—leading to inefficiency, exclusion, and unreliability. The proposed platform offers a centralized, AI-driven alternative to improve fairness, accessibility, and transparency. It uses semantic CV parsing, NLP, and hybrid recommender systems for accurate, personalized matching. Geospatial technologies enable proximity-based recommendations, reducing friction in on-site hiring and service delivery. A multi-layered trust system combines micro-credentials, digital badges, automated verification, client feedback, and job history to generate transparent trust scores. AI-based skill matching aligns user experience with job needs, while smart scheduling lets workers define availability for real-time matching. Users can earn verified skill badges via in-app micro-certifications or quizzes. Live video interactions support pre-hiring interviews, enhancing communication and reliability. A community-rated trust system evaluates communication, punctuality, and task completion for holistic credibility. An AI-powered resume builder auto-generates professional resumes from profile data, boosting employability. To address the digital divide, the app includes offline access, SMS alerts, low-bandwidth interfaces, and multilingual onboarding. Fairness-aware algorithms, bias detection, and privacy-by-design ensure ethical AI use and data security. Initial evaluations show improved matching accuracy, trust, and engagement—especially in rural areas. By combining efficiency, inclusivity, and accountability, the platform offers a scalable model for responsible AI-driven recruitment in Sri Lanka and other developing regions.

**Keywords:** *Artificial Intelligence, Location-Based Mobile Application, Job Matching, Micro Credentials, Ethical AI, Trust System, Sri Lanka*

# AI-Powered Cross-Allergen Detection System Using Skin Prick Test Reports

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**Abstract**

Food allergies are an escalating global health concern, affecting nearly 10% of the world's population and posing severe risks to patient safety and quality of life. Although accurate diagnosis plays a vital role in effective allergy management, many patients face ongoing challenges in understanding and interpreting complex medical reports, particularly those derived from Skin Prick Tests (SPTs). The technical nature of these diagnostic results often leads to confusion and uncertainty in daily food choices, thereby increasing the risk of allergic reactions. Addressing this gap between diagnosis and patient comprehension is crucial for improving self-management and safety outcomes. This study introduces an innovative AI-powered Cross-Allergen Detection System designed to simplify allergy-related medical information and provide actionable dietary guidance. The system adopts a modular architecture comprising three key components: (1) a report analyzer that processes and translates technical SPT data into clear, visualized, and user-friendly insights; (2) a machine learning–based cross- allergen predictor that identifies and quantifies potential cross-reactivity risks between allergens; and a chatbot assistant that offers real-time, personalized dietary recommendations and guidance based on the user's allergy profile. To ensure patient-centered design, a structured questionnaire was administered to individuals with diagnosed food allergies and caregivers to collect insights on existing challenges, expectations, and preferred system features. The findings from this preliminary stage informed the design and functionality of the proposed solution, emphasizing accessibility, personalization, and reliability. The anticipated outcomes of this research include enhanced patient safety, reduced frequency of allergic incidents, and increased confidence in managing food allergies. By leveraging artificial intelligence and human-centered design, this study contributes to the advancement of precision medicine and digital healthcare, offering an intelligent, data-driven solution for more effective and informed allergy management.

**Keywords:** *Food allergies, Skin Prick Test, Cross-allergen detection, Artificial Intelligence, Chatbot.*

# Design and Implementation of An Ai-Powered Adaptive Study Group Matching Platform Based on Subject Interests and Social Preferences

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**Abstract**

Working together in study groups is a well-known way to boost academic success and stay motivated during university. Yet, many universities still rely on simple methods like random groupings or sorting students by grades only. These approaches miss crucial aspects such as individual study preferences, social dynamics, and availability, often resulting in mismatched groups and ineffective collaboration. This project sets out to build a smarter solution—an AI-powered platform that actively considers a student's subject interests, preferred study style, availability, competency levels, and social preferences when forming study groups or buddy pairs. By leveraging machine learning, the system aims to make group formation more adaptive and balanced, ultimately fostering better teamwork, engagement, and learning outcomes. A mixed-methods approach is used, combining quantitative data analysis with qualitative feedback from students through surveys and interviews. This helps evaluate not only how accurately the AI matches students but also how the platform is perceived in terms of usability and fairness. The platform will use automated notifications to keep students updated and connected. It is expected that this approach enhances group cohesion and provide a more personalized learning experience. Future phases will validate these outcomes through pilot testing and continuous refinements based on user feedback. This work hopes to contribute new insights into how AI can support collaborative learning in meaningful and ethical ways.

**Keywords:** *Artificial Intelligence, Machine Learning, Collaborative Learning, Study Groups, Educational Technology.*

# Review on an ML Enabled P2P Platform for Enhancing Access to Updated Academic Resources Among Sri Lankan Undergraduates

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**Abstract**

Access to up-to-date and relevant academic resources is a persistent challenge for Sri Lankan undergraduates due to many systematic issues including outdated physical libraries, costly subscriptions, and poor internet infrastructure. Centralized e-learning systems though proven transformative globally, still remain inaccessible to many students, particularly in rural and semi-urban areas where connectivity and affordability are limited. This review explores the potential of integrating peer-to-peer (P2P) networking with Artificial Intelligence (AI) and Machine Learning (ML) techniques for content filtering and recommendations to improve equitable access to academic materials. Drawing on existing literature published between 2000-2025, the paper synthesizes how decentralized content distribution combined with lightweight ML models can overcome the aforementioned barriers while ensuring resource relevance, credibility, and personalization. The discussion confirms the viability of this hybrid P2P/ML model for the Sri Lankan higher education context, while emphasizing that successful implementation requires robust strategies to address systemic issues, including copyright management, the integration of reputation-based incentive mechanisms to counter free-riding, and preparing users for ethical digital sharing.

**Keywords:** *Peer-to-Peer, Academic Resources, Content Filtering, Content Recommendation, Sri Lankan Undergraduates*

# Smart Grocery Shopping Assistant: Cheapest Price Finder with Cost Optimization

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**Abstract**

In today's economy, grocery shopping represents a major household expenditure, yet consumers lack effective tools to optimize their purchasing decisions across multiple stores. This paper presents a Smart Grocery Shopping Assistant that combines machine learning algorithms with natural language processing to minimize total shopping costs while providing intelligent product substitutions. The system employs Random Forest and Logistic Regression models for price level prediction, achieving 87% accuracy in categorizing products into price segments. The NLP component utilizes fuzzy matching algorithms with RapidFuzz for accurate product identification from free-text grocery lists, achieving 90% matching accuracy. The optimization engine implements cost minimization strategies that resulted in average savings of 67.5% on test grocery lists through intelligent substitute recommendations. The system processes 25,768 grocery products across multiple categories, demonstrating scalability and practical applicability. Results indicate significant improvements in budget management and price transparency, with the integrated Streamlit application providing an intuitive user interface for consumer adoption. This system has noteworthy societal and economic benefits by helping low-income households reduce food expenses and supporting sustainable consumer shopping practices.

**Key words:** *Machine Learning, Natural Language Processing, Price Prediction, Cost Optimization, Grocery Shopping*.

# Smart Electricity: Intelligent Billing, Monitoring, and Optimization System

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**Abstract**

Traditional electricity billing in many developing regions still relies on manual readings and static tariffs, producing delays, inaccuracies and no real-time visibility for consumers. The project 'Smart Electricity' designs and implements an integrated mobile and cloud system that combines (1) real-time load monitoring, (2) machine- learning bill forecasting, (3) wire-damage and overload detection, and (4) an AI- driven tariff advisor to recommend cost-effective plans. The system ingests simulated smart-meter streams, open electricity datasets and survey data; the backend uses a Python/Node.js pipeline with Android frontend and Firebase for telemetry and authentication. Forecasting experiments will compare time-series (ARIMA), deep models (LSTM), and ensemble learners (Random Forest/Boost) evaluated with MAE/RMSE and cross-validation. Fault detection will use feature extraction anomaly detection (one-class SVM/autoencoder) and supervised classifiers for event identification; the tariff advisor uses scenario simulation and optimization to estimate potential savings. Evaluation combines quantitative model metrics, a usability study, and cost-saving simulations to assess real-world benefit, safety improvements and user acceptance. Expected contributions are (a) a single, low-cost prototype that consolidates billing, forecasting, safety and tariff advice; (b) a validated ML pipeline tuned for limited/realistic datasets; and (c) evidence that integrated, user-centered systems can increase transparency, reduce costs and improve safety for residential consumers. The project addresses a gap in current literature where these components are developed separately rather than as a unified, deployable platform.

**Keywords:** *Smart Meter, Load Forecasting, Electricity Billing, Fault Detection, Tariff Optimization*

# A Platform for Affordable Accommodation and Real-time Safety Guidance for Foreign Tourists

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**Abstract**

Unquestionably, tourism is significant, valuable, and rapidly changing. However, middle-income tourists struggle with the issue of expensive and secure lodgings. Current platforms, like Airbnb and Booking.com, provide no real-time safety features and have little to no focus on the lower end of the market. To address this, a study is proposed with a focus on the integration of peer-to-peer lodgings with safety-centric geo information systems (GIS) and other technologies to improve the travel experience. This platform is designed with geographical and contextual multi-functionalism and contains tourist and homeowner data collection and processing. Firebase, GIS APIs, and the software React Native will help in implementing the designed methods. The fused personalization in accommodation, recommendations with hazard todo-avoid mechanisms and real-time alerts will help traveler metasystems focus on safety. Research shows that affordability, personalization, and safety have been studied, but not in conjunction. The aim of the study is to provide information on places in Sri Lanka, where tourists and locals will benefit from inexpensive accommodation, supplemented with geo-fencing, live alerts to hazardous places, and notifications that provide real-time safety.

**Keywords:** *Affordable accommodation, Tourism safety, Recommendation systems, GIS, Peerto-peer platforms*

# AI-Driven Babysitting Mobile Application: A Comprehensive Solution for Safe and Reliable Childcare Services

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**Abstract**

At present, in the fast-paced and digitally connected society, working parents face increasing difficulties in finding trustworthy and reliable childcare solutions. Conventional babysitting platforms offer limited safety assurances, relying on manual verification and minimal real-time oversight. This research introduces an AI-driven babysitting mobile application that redefines childcare by integrating artificial intelligence, real-time monitoring, and automated verification within a unified, user-centric ecosystem. The proposed system employs machine-learning algorithms for background authentication, behavioral analysis, and predictive safety assessment, while enabling live tracking, anomaly detection, and instant emergency alerts. Built using React Native, TensorFlow, Firebase, and OpenCV, the platform ensures secure cross-platform operation and seamless communication between parents, verified babysitters, and administrators. The system architecture integrates document verification through computer vision, natural-language analysis for reference validation, and adaptive learning for personalized care recommendations. Prototype evaluations demonstrate 95% accuracy in identity verification and 90% precision in risk factor identification, significantly outperforming traditional screening methods. User testing confirms high satisfaction with interface design, monitoring precision, and privacy controls, underscoring the application's usability and trustworthiness. The AI-enabled emergency-response framework further enhances resilience by autonomously distinguishing genuine threats from normal activity and initiating context- appropriate responses. This research establishes a new paradigm for technology-assisted childcare, positioning AI as an ethical partner in ensuring safety, transparency, and personalized support. Unlike existing caregiver-matching services, this platform functions as an intelligent safety-assurance system, merging predictive analytics with real-time situational awareness.

**Keywords:** *Artificial Intelligence, Mobile Application, Childcare Safety, Background Verification, Real-time Monitoring*

# A System for Machine Learning-Based Malware Detection

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**Abstract**

The increasing sophistication of modern malware poses a significant challenge to traditional signature-based detection systems, which often fail to recognize newly emerging or polymorphic malware. This study proposes a machine learning-based malware detection framework that leverages static features from executable files to identify both known and unseen threats. Using a dataset of 100,000 Windows Portable Executable (PE) samples, three classifiers—Random Forest, Logistic Regression, and Decision Tree were evaluated based on accuracy, precision, recall, and F1-Score. The Random Forest classifier achieved the highest accuracy of 98.2%, outperforming other models. A feature importance analysis revealed that API call frequencies, section entropy, and header metadata are critical indicators of malicious behavior. The findings demonstrate the potential of machine learning to enhance Cybersecurity defenses, offering a scalable, adaptive, and effective approach to detect malware in real-world computing environments. This framework can be further extended to incorporate hybrid analysis methods and deep learning models for improved robustness and resilience against emerging threats.

**Keywords:** *Malware Detection, Machine Learning, Random Forest, Cybersecurity, Feature Importance*

# A Review on AI-Powered Fully Automated Lost and Found Management Systems in the Hospitality Industry

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**Abstract**

Lost and found management is a prevalent issue for the hospitality industry, where maintaining guest trust and efficient operations are essential. Existing systems used in universities, transportation, and airports rely on centralised databases with low ownership verification and little cross-system records integration. Such methods are ineffective in hotels because higher-level validation is necessary due to the frequency of social interactions with guests. This study suggests a hotel-oriented framework that combines AI with contextual verification. A literature review of approximately 25 academic and industry sources was undertaken to explore the methods in automated image recognition, claim verification, and AI technology applications in hospitality management. Key insights included the need for item recognition, ownership verification, and seamless integration of guest records. Based on the conceptual findings, a system would be designed as follows: image recognition using the CNN algorithm, claims validation with a 90% similarity threshold, automatic questioning to prevent fraudulent claims, and a log of hotels' official visits. The system is still under development and implementation, and testing will form the next phase of this research. The proposed hybrid approach offers a scalable, accurate, and trustworthy solution to the hotels' lost and found issue. The research demonstrates how leveraging operational data can identify essential attributes that transform a conventional manual service into an efficient and more dependable one through an interdisciplinary approach.

**Keywords:** *Artificial Intelligence, Lost and Found Systems, Computer Vision, Hospitality Management, Deep Learning*

# A Comparative Analysis between Rainfall Prediction and Temperature Trend Forecast using the WeatherAus Dataset

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**Abstract**

Planning for climate adaptation, natural resource management, and agriculture all depend on accurate forecasting of climate variables such as temperature and rainfall. Using the WeatherAus database, which provides long-term meteorological information across several Australian regions, this study compares the forecasting of temperature trends and rainfall. To assess model accuracy, robustness, and computational efficiency, statistical techniques, including the ARIMA model and machine learning–based predictive methods, were applied. The findings indicate that rainfall prediction is more complex due to spatial and temporal variability, whereas temperature forecasting is more stable and predictable. Additionally, the results show that predictive performance can be improved by hybrid systems that combine machine learning techniques with climate indices. This study advances the field of climate informatics and offers insights to scholars and decision-makers to develop climate-resilient and sustainable plans.

**Keywords:** *Rainfall Prediction, Temperature Forecasting, Weatheraus Database, ARIMA, Machine Learning, Climate Informatics.*

# Integrated Call Agent Assistance System to Enhance Call Center Efficiency and Customer Satisfaction

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**Abstract**

Call centres constitute a critical operational component within organisations, primarily interacting with their customer base. Call centre agents are responsible for a broad range of responsibilities, including addressing routine inquiries and delivering Level 1 technical support. Despite their critical role, operational efficiency of call centres is frequently compromised by "dead air time", the silence during a call, where the customer is left waiting, wherein agents search for relevant information across unstructured and fragmented sources. This study presents the design and development of an Integrated Call Agent Assistance System, a cost-effective offline desktop application intended to enhance response accuracy and reduce latency in customer interactions. The proposed system incorporates speech-to-text processing, real-time keyword recognition and chatbot-enabled information retrieval. During live customer interactions, the system identifies the keywords and dynamically presents the relevant content in the agent interface. Additionally, it is capable of providing instant responses to the text-based queries that call agents submit through the chatbot, based on the predefined information organised in the local knowledge base. The system's offline functionality ensures reliability in environments with limited connectivity. The system is to be developed using agile methodology, promoting flexibility and iterative refinement. Python is the primary programming language due to its versatility and extensive support for natural language processing, and SQLite is often considered for database implementation. The requirements elicitation process involved qualitative methods, including interviews and observations of call centre agents. This study presents a practical and adaptable framework designed to bridge the gap between costly enterprise platforms and accessible, intelligent support tools tailored for small and medium-sized organisations. It presents how targeted interventions can effectively mitigate key inefficiencies within call centre operations, laying the groundwork for sustained innovation in customer service systems.

**Keywords:** *Call Centre, Knowledge Base, Chatbot, Speech-To-Text, Customer Satisfaction*

# A Strategic Framework for Machine Learning-Driven Obesity Prediction: A Synthesis of Multimodal Approaches

Shayila, S.M.F, Rathnayake. R.M.K.N, Thaslifa, M.T.F, Wijesinghe, A.S.N, Lakmali, J.M.D, Herath, H.M.D.S

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**Abstract**

The obesity condition across the world requires the application of advanced predictive methods beyond conventional metrics such as the BMI. This paper is a comparative synthesis of ten peer-reviewed articles based on the synthesis of ML models to predict obesity. The synthesis includes machine learning (ML) algorithms, such as Logistic Regression, Random Forest, XGBoost, and deep learning models, which are based on the results of large-scale surveys and wearable devices. There is also variation in performance with accuracies of between 74% to more than 96, no specific ML model has been found to be better than the rest. The choice of the model is based on certain health goals: random forest is good at classification, XGBoost at screening, logistic regression at interpretability, and deep learning at predicting the longitudinal weight change due to wearable data. The primary predictors are family history, physical activity, diet, and biomarkers such as CRP and insulin. This view promotes a goal-oriented, strategic approach to the choice of ML models based on data types and health goals to improve the ability to detect risks in the early stages and interventions. The framework is unique in the sense that it combines model selection strategies throughout multimodal health information to predict obesity.

**Keywords:** *Obesity prediction, Machine learning, Logistic Regression, Random Forest, XGBoost*

# Prototyping and Mixed-Methods Evaluation of a Multilingual AI Investment Assistant in Sri Lanka

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## Abstract

This study addresses the critical challenge of limited financial literacy among beginner investors in Sri Lanka, where only 32% demonstrate basic stock market knowledge. The research aims to develop a scalable and culturally adapted AI- powered investment assistant tailored for novice Sri Lankan investors to promote financial inclusion. The assistant leverages GPT-based language models integrated with real-time web scraping of Colombo Stock Exchange data, utilizing advanced machine learning algorithms. Its language support includes Sinhala, Tamil, and English, with a user profiling system that personalizes financial education and investment recommendations based on individual risk tolerance and experience. The methodology involved a stratified random sample of 300 novice investors from diverse geographic backgrounds, participating in a six-month pilot. Quantitative evaluation metrics included recommendation accuracy (87%), average response time (1.2 seconds), and user engagement analytics. Qualitative data from 40 in- depth interviews and usability testing assessed satisfaction, trust, and behavioral shifts, focusing on behavioral biases such as overconfidence and herd mentality. Ethical approval was secured, ensuring informed consent and data security. Results indicated a statistically significant 22% improvement in financial literacy scores within the treatment group ($p < 0.01$), alongside increased confidence and reduced biases. However, infrastructural limitations pose challenges in rural adoption. The research offers a culturally sensitive and technically robust AI solution that integrates technical, behavioral, and policy dimensions to foster inclusive financial participation. Future work will include longitudinal impact assessments, bias mitigation strategies, and expansion to other financial products. Limitations include the modest sample size and short intervention period. Overall, this research provides an evidence-based, adaptable model supporting digital financial literacy, behavioral change, and policy advocacy for emerging markets.

**Keywords:** *Financial Literacy, Artificial Intelligence, Behavioral Finance, Digital Inclusion, Novice Investors*

# A Comprehensive Review on AI-Powered Wearable Devices for Obstacle Detection and Navigation

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**Abstract**

The study presents a comprehensive systematic literature review investigating the development of intelligent wearable assistants for real-time obstacle avoidance and guidance systems for visually impaired individuals. With approximately 2.2 billion people worldwide, experiencing visual impairment, affordable and user-friendly navigation tools are critically needed. A systematic review of 30 peer-reviewed research papers published between 2016 and 2025 was conducted, examining key areas such as obstacle recognition and avoidance, wearable design, and feedback systems. Using a quantitative approach, the research evaluated the relevance of the identified papers, yielding 12 highly relevant, 5 moderately relevant, and the remaining as the least relevant. The review examined key performance aspects of different technical approaches. The multi-sensor fusion architectures combining ultrasonic sensors with RGB-D cameras demonstrated optimal cost-performance ratios, achieving 90-95% accuracy within acceptable power consumption limits. YOLO-based deep learning models demonstrated 92.16% accuracy for object recognition compared to 70% for traditional recognition methods. The most practical wearable device types for daily use were smart glasses, gloves, and shoes with haptic feedback systems, which were able to provide effective warnings with response times of 15 mints. Significant challenges still exist, such as poor outdoor performance, trouble detecting moving objects, and trade-offs between accuracy, battery life, and device weight. The study concludes that successful implementation requires balanced optimization across multiple performance metrics rather than maximizing a single performance metric. Future development should prioritize hybrid sensor architectures, weather- resistant algorithms for outdoor use, and user-centered design approaches to ensure practical usability for visually impaired individuals.

**Keywords:** *Wearable Technology, Obstacle Detection, Computer Vision, Assistive Devices, Visual Impairment*.

# Predictive Machine Learning Mobile Application for Sri Lankan Diet Tracking and Calorie Estimation to Address NCDs for Public Health

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**Abstract**

Dietary habits are the most important modifiable risk factors of non-communicable diseases (NCDs) in Sri Lanka. The inadequate availability of proper dietary assessment is the absence of detailed, culturally appropriate food composition databases that would reflect the nutritional values of the Sri Lankan standard cooked and mixed food items. Current data, including the United States Department of Agriculture (USDA) data base and the few national food tables, are mostly data on raw ingredients, which do not represent the complexity of calories and nutrients in locally prepared food. This research undertakes the necessary steps to fill this gap by creating a country-specific calorie database on the Sri Lankan food and incorporating it into an Android-based mobile application that would fit the needs of the target population, who are susceptible to diet-related health issues because of urban living, poor dietary practices, and academic pressures. The system utilizes the lightweight convolutional neural network (CNN) architectures to identify dishes by utilizing the food images and the ensemble regression model to estimate calories. The app allows automatic food dieting, customized nutrition tracking, and situational nutritional advice. Pilot testing on curated datasets showed about 75% top-one dish recognition and calorie estimation errors at par with international standards on mobile health applications. This combined solution addresses a critical knowledge gap in localized digital health applications, and provides a framework of scaling culturally tailored dietary evaluation and aiding the prevention and treatment of diet-related NCDs to the national public health system of Sri Lanka.

**Keywords:** *Food Composition Database, Calorie Estimation, Machine Learning, Android Application, Public Health, Dietary Tracking, NCD Prevention*

# Edge Preserving Smoothing and Denoising for Classification Using Bilateral Filtering

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## Abstract

This paper examines the use of bilateral filtering as a preprocessing step aimed at increasing the accuracy of algorithms such as boosting for classification. In image classification problems, the input data is a rigid bottleneck in the performance of a machine learning model, especially in models built on edge and texture features. Noise in images is usually reduced through the use of various linear smoothing filters, a common example being the Gaussian filter. These methods, however, tend to destroy vital edge information which is necessary to the process of feature extraction, and, as a result, the classification is performed poorly. In this paper, we consider a more advanced alternative, the bilateral filter as first described by Tomasi et.al. [1]. A bilateral filter, in contrast to Gaussian filtering, eliminates edge distortion by smoothing the image based on the spatial distance and photometric closeness of pixels. This consideration enables the filter to erase the noise while keeping necessary elements that are vital for accurate object recognition and classification structures. This research assesses the role of bilateral filtering in boosting techniques, especially Adaptive Boosting (AdaBoost). We perform image preprocessing comparisons using bilateral and Gaussian filters and assess their impact on classification accuracy. Here, ROC curves and object detection outcomes are used to assess the improvements. The findings reveal that bilateral filtering outclassed Gaussian filtering in all instances of classification accuracy. This underscores the importance of edge-preserving denoising methods for the preprocessing stage, especially in cases that require structural detail precision for the model to perform optimally.

**Keywords:** *Bilateral Filter, Edge-Preserving Smoothing, Boosting Algorithms*

# Blood Cancer Prediction Using Deep Learning with Fine-Tuning

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**Abstract**

Blood cancer remains one of the most serious health challenges worldwide, and early detection plays a vital role in improving treatment outcomes. Traditional diagnostic methods rely heavily on manual examination of blood samples, which can be time-consuming and prone to human error. This study introduces a deep learning-based approach for detecting blood cancer from microscopic blood cell images. A convolutional neural network (CNN) model was designed and fine-tuned through hyperparameter optimization and data augmentation to improve accuracy and reliability. Using a publicly available dataset of blood cell images, the model achieved an accuracy of 99% and showed better performance than traditional algorithms such as Random Forest and Support Vector Machine. The results demonstrate how deep learning may efficiently detect cancerous blood cells, minimize diagnostic delays, and improve professionals in obtaining faster and more accurate diagnoses.

**Keywords:** *Deep Learning, Fine- tuning, Blood cancer, Convolutional neural network, Image processing.*

# Strategies to Overcome the Challenges in the International Expansion of Sri Lankan Quantity Surveying Consultancy Firms

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**Abstract**

Currently, the Sri Lankan Quantity Surveying consulting firms are facing both substantial opportunities and significant challenges when expanding internationally. This study examines the competitive strategies that enable QS firms to succeed in foreign markets, focusing on the critical risks, key outsourced services, and strategic adjustments required for sustainable global performance. It presents one of the few empirical investigations centred specifically on the internationalisation of Sri Lankan QS firms, offering a unique blend of theoretical insight and practical guidance. A structured questionnaire survey was conducted among professionals working in Sri Lankan QS consultancy firms, with data analyzed using the Relative Importance Index (RII). The survey targeted core areas including essential outsourced services, primary risks associated with international expansion, and effective strategies for global competitiveness. The most significant risks identified were economic instability, financial uncertainties, and technical challenges, followed by managerial and legal concerns. These factors present tangible barriers to smooth international operations. In terms of competitive strategy, the study finds that achieving cost leadership through the adoption of advanced technologies, such as BIM, CostX, and PlanSwift, and differentiation through high-quality, client-focused service delivery are the most effective paths to success. Establishing a strong brand identity, prioritizing sustainability through green certifications like LEED and BREEAM, and enhancing digital presence will further elevate their global reputation. This study provides a comprehensive framework for Sri Lankan QS consultancy firms seeking to navigate the complexities of global expansion, bridging academic theory with actionable business practice.

**Keywords:** *QS consultancy firms, Sri Lanka, International Expansion, Competitive Strategies, Outsourcing Services, Risk Management.*

# Development of A Polyherbal Face Pack Containing *Santalum album, Coriandrum sativum, Cyperus rotundus, Saussurea lappa, Coscinium fenestratum* and *Curcuma longa* For the Diminishing of Acne and Facial Spots.

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**Abstract**

The demand for safe skincare products has increased interest in herbal formulations. This study aimed to develop and evaluate twelve polyherbal face pack powders using six medicinal plants—Santalum album, Coriandrum sativum, Cyperus rotundus, Saussurea lappa, Coscinium fenestratum, and Curcua longa (used as a natural preservative)—selected for their antimicrobial, anti-inflammatory, and antioxidant properties. Five formulations, named F1, F2, F3, F4, and F5, were prepared using a statistical approach to evaluate the effectiveness of various ingredient combinations. The formulations were prepared in varying ratios, with F1 and F5 recommended based on preliminary screening. Phytochemical analysis confirmed the presence of alkaloids, polyphenols, terpenoids, saponins, essential oils, carbohydrates, and proteins. Physicochemical parameters, such as pH (5.7–5.9), ash content (4.3%–5.0%), and moisture content, were within acceptable limits compared to a commercially available herbal face pack selected through market research on acne and facial spot products, in accordance with ISO cosmetic guidelines. Antimicrobial activity was assessed via the disc diffusion method against Escherichia coli and Staphylococcus epidermidis, comparing the formulations to the commercial control. which improved significantly with preservative addition. Two surveys were conducted: one involving 200 university students to gauge attitudes toward herbal skincare, and a second with 20 participants who applied the recommended face packs (powder form) for two weeks. Both surveys indicated positive outcomes, including improved skin appearance and no reported side effects. This study concludes that these polyherbal powder formulations can serve as effective, natural alternatives to synthetic skincare products, with significant potential for further development and commercialization.

**Keywords:** *Polyherbal, Face pack, Antimicrobial, Anti-inflammatory, Acne*

# Formulation, Quality Evaluation, and Shelf-life Determination of *Dioscorea alata l.* (purple yam) Jam.

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**Abstract**

Dioscorea alata L., or purple yam, is an edible starchy tuber crop. Its distinctive purple hue and flavour profile offer opportunities for sensory appeal in various food formulations. In this study, three formulations of jams were prepared using purple yams, sugar, gelatine, and lime. All three formulations were subjected to sensory and physicochemical analysis, as well as shelf-life determination, under Association of Official Analytical Chemists (AOAC) standards. Sensory analysis was conducted using the five-point hedonic scale with the participation of 40 untrained panelists. The results were analysed using Minitab 17.0 software, indicating statistically significant differences ($p<0.05$) in appearance, flavour, mouthfeel, sweetness, colour, and overall acceptability. The jam formulation that exhibited the highest overall acceptability (3:3:1:2, w/w ratio of purple yam, sugar, gelatine, and lime, respectively) was selected for physicochemical analysis, which was conducted over 7 weeks while storing the jam at 5 ± 2°C. The pH of the chosen jam formulation varied between 4.0 - 5.0, titratable acidity ranged between 0.32% - 0.57%, and total soluble solids varied between 15%- 25%, while the moisture content ranged from 30.05% - 41.24%. The same sample was selected for the microbial test to determine the shelf life over 6 weeks while storing the jam at 5 ± 2°C. Microbial tests, yeast and mold determination, and total plate count were carried out for 6 weeks. Total plate counts showed no growth until week 4. In the yeast & mold test, no growth was observed until week 2. According to the results, microbial growth increased within 6 weeks. These findings offer valuable insights into the quality attributes of the formulated jam, highlighting the need for a comprehensive analysis to assess its viability for commercial production.

**Keywords:** *Dioscorea Alata, Jam, Sensory, Physicochemical, Shelf-Life*

# Geospatial Framework to Identify Urban Heat Hotspots and Greening Priority Zones in Trincomalee Town & Gravets DS Division, Sri Lanka

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**Abstract**

Urban heat and vegetation loss are the most critical environmental issues in rapidly urbanising areas. Trincomalee Town and Gravets DS Division are the primary administrative centres of Trincomalee District in Sri Lanka, which have experienced significant land-use changes in recent years. This has caused environmental imbalance and urban thermal discomfort. This study analyses the spatial distribution of urban heat, vegetation dynamics, and greening priorities for the year 2025, and focuses on data-driven solutions aligned with green technology and climate solutions. Landsat 8 imagery was used to extract five main remote sensing indices, namely, NDVI, NDBI, NDWI, LST, and UTFVI, to derive and understand the distribution of vegetation, built-up area, surface water, thermal, and ecological stress. A Greening Priority Index (GPI) was developed by standardizing NDVI and LST (GPI = z_score (LST) - z_score (NDVI)) to identify zones with high thermal stress and low vegetation cover. In addition, Getis-Ord Gi* statistic-based hotspot analysis was performed on NDVI and LST, to identify the spatial clusters, such as hotspots and cold spots of heat and vegetation cover. The results highlight the significant spatial distributions. About 39.92% of the study area falls under High or Very High GPI zones, illustrating the insufficient vegetation cover and showing the need for greening, while about 40% of the area shows a significant greening effect. Some GNDs such as Sampalthivu, Muththunagar, Eluppaikulam, and the central part of the Trincomalee region show the Land Surface Temperatures above 37 °C, with UTFVI values greater than 0.2, identifying them as ecologically vulnerable and thermally uncomfortable areas. Conversely, some GND areas like Kanniya and Sumedhanakarapura have stronger vegetation and reduced thermal stress. This research underscores how geospatial technologies can operationalize climate-sensitive urban planning in data-scarce environments, offering scalable solutions for Sri Lanka's broader green technology and climate resilience goals.

**Key words:** *Greening Priority Index (GPI), Land Surface Temperature (LST), Geographic Information Systems (GIS), NDVI, Remote sensing*

# Evaluating Growth Performance of Spinach in Aquaponics Systems Integrated with Guppies and Carp

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**Abstract**

An experiment was conducted over 34 days to investigate the growth performance of spinach (Spinacia oleracea L.) in aquaponics systems integrated with two ornamental fish species: guppies (Poecilia reticulata), and carp (Cyprinus carpio). Each treatment consisted of three replicate tanks, with each replicate tank containing 4 fish. A control tank was maintained using 50 mL of diluted Albert solution as a commercial nutrient source. Spinach plants were cultivated using a deep-water culture method, and fish were fed with a commercial diet containing 36% crude protein. Water quality parameters, including pH, temperature, and dissolved oxygen (DO), were monitored regularly to ensure optimal conditions for both fish and plants. Plant growth parameters such as height, leaf count, root length, fresh weight, and dry weight were measured weekly, and nutritional analysis was conducted at harvest. Results showed that spinach grown in guppy-based systems (Treatment 01) exhibited the highest growth rates, with plant heights ranging from 14.7 cm to 18.2 cm, leaf counts from 6 to 10, and root lengths from 18.5 cm to 41.7 cm. Fresh leaf weights ranged from 5.39 g to 8.72 g, and dry weights from 0.23 g to 0.61 g, with dry matter percentages between 4.17% and 6.99%. Carp-based systems (Treatment 02) provided stable water conditions but resulted in slower plant growth, with plant heights ranging from 13.0 cm to 18.7 cm, leaf counts from 5 to 9, and root lengths from 9.5 cm to 21.2 cm. Fresh leaf weights ranged from 3.49 g to g, and dry weights from 0.11 g to 0.38 g, with dry matter percentages between 3.07% and 6.85%. The study concluded that guppies are highly effective for nutrient cycling in aquaponics, though they require frequent monitoring to maintain system stability. Carp fish offer more stable environments, making them suitable for low- maintenance systems. The control plants showed comparatively lower growth and nutrient content than the aquaponic treatments. The findings highlight the potential of ornamental fish species as nutrient providers in aquaponics and demonstrate that guppies and carps can both support sustainable plant production in integrated systems.

**Keywords:** *Aquaponics, Spinach, Guppy, Carp, Plant growth*

# Exploring Social Media Usage Patterns Among University Students in Sri Lanka

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**Abstract**

This study examines how and why college students in Sri Lanka utilise social media, as well as the effects it has on them. The researchers conducted interviews with four students from various fields to gather their perspectives. The results show that social media helps students communicate with each other, have fun, and collaborate on schoolwork. However, it can also cause problems, such as difficulty focusing and increased stress. Most students recognise both the positive and negative aspects of social media and employ various strategies to manage its impact on their schoolwork and overall well-being. The study explores the importance of teaching students how to utilise social media effectively and cultivate good habits at university to maximise the benefits of these platforms.

**Keywords**: *Social Media, University Students, Academic Performance, Digital Self-Regulation, Psychological Well-being*

# The Strategic Contribution of Talent Management to Employee Morale and Job Satisfaction in Sri Lanka's Insurance Industry

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Talent Management (TM) has become a cornerstone of organizational strategy in service-driven industries where human interaction defines customer experience. Within Sri Lanka's insurance sector, employees balance technical precision with the emotional demands of supporting clients during moments of vulnerability, making morale and job satisfaction central to performance. This research examines how TM practices influence these outcomes, with particular focus on leadership, recognition, career development, and well-being. A qualitative multiple case study design was employed across five leading insurance companies, supported by survey data and secondary documentation. Findings reveal that empathetic leadership, personalized recognition, transparent career pathways, and well-being integration significantly strengthen employee motivation and satisfaction. Conversely, rigid hierarchies, limited career growth, and neglect of emotional well-being foster disengagement and increase attrition. Recognition was identified as an immediate yet underutilized driver of morale, particularly when expressed in personal and authentic ways. Leadership behavior emerged as the most decisive factor; managers who demonstrated empathy and emotional intelligence created psychologically safe environments, while autocratic approaches led to stress and disengagement. Career inactivity was interpreted as a breach of the psychological contract, reducing trust and loyalty. Emotional exhaustion was widespread among claims officers, yet few firms offered structured wellbeing programs. The findings align with Social Exchange Theory, Emotional Intelligence Theory, and the Job Demands Resources (JD-R) model, emphasizing the need to balance demands with supportive resources while embedding fairness, empathy, and reciprocity into TM. A Human Centered Talent Management (HCTM) framework is proposed that integrates empathetic leadership, dual recognition systems, flexible career opportunities, culturally adapted feedback channels, and well-being initiatives. This study demonstrates that morale and job satisfaction in Sri Lanka's insurance sector depend not only on material incentives but also on emotional, cultural, and psychological factors. Embedding HCTM practices offers firms a pathway to strengthen retention, resilience, and sustainable performance. This is important in an increasingly competitive service environment.

**Keywords**: *Talent Management, Employee Morale, Job Satisfaction, Emotional Intelligence, Insurance Sector*

# Role of negative urgency, impulsivity, and financial management practices in compulsive buying: a study in Malabe, Colombo area

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## Abstract

Compulsive buying has become a common and serious issue with significant financial and psychological effects. It impacts people's financial security and increases stress, anxiety, and emotional pain. As consumer culture expands, an increasing number of individuals struggle with their spending habits, making compulsive buying a pressing issue that warrants further investigation and targeted solutions. This study focuses on the role of negative-urgency impulsivity —i.e., the tendency to act impulsively during negative emotions —and on financial management practices in relation to compulsive buying. Data were collected from a diverse sample of 162 adults using well-established psychometric scales to measure four key factors: compulsive buying behaviour, impulsivity, financial management habits, and psychological distress. The results showed a strong positive link between compulsive buying and both impulsivity and psychological distress. People with higher impulsivity scores were much more likely to shop excessively, often as a way to cope with emotional discomfort. On the other hand, good financial management practices were negatively linked to compulsive buying, suggesting that better money management may help protect against this behaviour. Additionally, the analysis found that financial management practices partially influenced the relationship between impulsivity and compulsive buying. Individuals with high impulsivity often have poor financial habits, which increases the severity of their compulsive purchasing behaviours. This mediation effect highlights how personality traits and practical skills work together to shape consumer habits. These findings emphasise the important roles of psychological traits and financial behaviours in driving compulsive buying. .

**Keywords:** *Compulsive buying, Impulsivity, Financial management, Negative urgency, Psychological distress*

# The Effect of Social Media Marketing on Brand Loyalty in the Hospitality Industry in Sri Lanka: With Special Reference to Social Media Users in Sri Lanka, Colombo District

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## Abstract

This paper examines the impact of social media marketing (SMM) on brand loyalty in the hospitality business in Sri Lanka, with special consideration given to the social media users in the Colombo District. The hospitality industry is a highly competitive environment, and brand loyalty has been a crucial factor in achieving long-term stability and profitability. As the world becomes increasingly digital in customer interactions, social media networks and applications have become essential tools in shaping consumer perceptions and loyalty (Kaplan & Haenlein, 2010; Leung et al., 2013). The study was meant to determine the impact of three constructs, namely, social media marketing, media sharing networks and consumer review networks on brand loyalty. A quantitative research design was employed, utilising a structured questionnaire administered to 250 participants, resulting in 226 valid responses, which yielded a response rate of 90.4%. Data were compared using SPSS with descriptive statistics, correlation, and regression analysis. The results showed a positive relationship between brand loyalty and a statistically significant relationship between the marketing activities on Arabian social media and social media marketing activities. The media-sharing networks (Instagram and YouTube) and consumer review networks (TripAdvisor) also prhave also been found to have a significant impact on increasing consumer trust, satisfaction have a significant impact on increasing consumer trust, satisfaction, and the intent to become a repeat customer (Ebrahim, 2020; Salem & Salem, 2021). The results of the regression analysis indicated that all three constructs had significant predictive power for brand loyalty, with the strongest relationship observed between social media marketing and brand loyalty.

**Keywords:** *Consumer Review Networks; Brand Loyalty; Hospitality Industry; Media Sharing Networks; Social Media Marketing*

# The Impact of Social Media Marketing on the Online Purchase Intention of Secondhand Vehicles in Sri Lanka

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## Abstract

In Sri Lanka, many people now use social media to buy and sell secondhand cars. However, it is unclear how these social media posts and ads actually influence people's decisions to purchase a car online. This study examines the impact of social media marketing on the online purchase intention for second-hand vehicles in Sri Lanka. To understand this, we conducted in-depth interviews with young Sri Lankan adults who were considering purchasing a vehicle. We asked them about their experiences with social media ads, their trust in online reviews, and how these factors influenced their decision-making. The study found that social media platforms, such as Facebook, Instagram, and YouTube, play a crucial role in informing buyers about available vehicles and facilitating price and feature comparisons. Buyers, in particular, appreciate videos and detailed photos that enable them to inspect the car online. However, a major challenge is trust. While some buyers trust posts with many positive comments, others are very sceptical because of fake ads and dishonest sellers. Many buyers said they look at social media for information, but they do not fully trust it. They often check other sources before making a final decision. The research concludes that social media is a powerful tool for attracting customers, but it does not automatically lead to sales. The success of a seller depends on the trust they build in the customer through transparency, customer reviews and clear communication. This research helps sellers understand how to use social media more effectively to connect with Sri Lankan buyers of secondhand vehicles.

**Keywords:** *Social Media, Purchase Intention, Secondhand Vehicles, Marketing*

# Examining The Influence of Flexible Work Arrangements on Employee Innovative Behaviour with Special Reference to the IT Industry

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## Abstract

This research investigates the influence of flexible work arrangements (FWAs), specifically flextime and telecommuting, on employee innovative behaviour (EIB) in Sri Lanka's IT industry. The study was motivated by the increasing importance of innovation for competitiveness and the limited adoption of FWAs within Sri Lanka due to rigid labour laws and traditional work structures. Based on Self-Determination Theory, the research highlights that FWAs enhance autonomy and capability, which promote innovation. A structured questionnaire was used to collect data from 142 IT professionals, within the framework of a deductive, quantitative research methodology. Statistical analysis using IBM SPSS included correlation and regression methods to test the proposed hypotheses. Based on the findings, telecommuting has a stronger impact on employee innovative behaviour than flextime, although both have a significant positive impact. Flextime accounted for 36.6% of the variance in EIB, while telecommuting explained 49.5%. The results confirm that flexibility enables employees to balance personal and professional responsibilities, reduce stress, and engage in creative problem-solving. The study concludes that flexible work arrangements are essential strategies for enhancing innovation in Sri Lanka's IT industry. Organisations should view these practices as strategic tools rather than employee benefits, and policymakers should consider updating labour frameworks to facilitate broader adoption. By implementing FWAs into organisational culture and HR strategy, IT firms can promote innovation and gain a competitive advantage in the global knowledge economy.

**Keywords:** *Flexible Work Arrangements, Flextime, Telecommuting, Employee Innovative Behaviour, IT Industry*

# Influencer Marketing vs. Traditional Advertising: A *Comparative Analysis*

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## Abstract

This paper compares the credibility of influencer marketing and traditional advertising. Key results on how credibility of sources, trustworthiness, fit, and transparency influence customer confidence, brand attitudes, and buy intention are extracted from an analysis of current independent research and industry reports. Research indicates that influencers often perform better in terms of perceived reliability and relational trust, particularly among young customers, although traditional advertising remains effective in terms of reach and brand awareness. To encourage verification and further research, this conclusion is accompanied by managerial suggestions and a listing of 40 studies in the appendix.

**Keywords:** Influencer marketing, traditional advertising, credibility, consumer trust, marketing effectiveness

# The Impact of AI Tools on Student Performance of Marketing Undergraduates in Sri Lankan Higher Education Institutions (HEIs)

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## Abstract

The higher education sector in Sri Lanka utilises different software based on artificial intelligence tools, for instance, in marketing undergraduate education. With such integration, personalised learning can be developed, catering to each student's needs, thereby contributing to student success and engagement. AI platforms provide instant feedback, enabling students to adaptively navigate through various learning scenarios designed to simulate marketing situations, which in turn helps students better understand complex marketing theories and develop critical thinking skills. Research in Sri Lankan Higher Education Institutions (HEIs) found that AI tools assist student performance in an environment with weak AI infrastructure, limited educator readiness, and lack of resources. Successful implementation of AI learning must be supported by investments in AI infrastructure, faculty training, and policy support to ensure the full potential of AI is realised while ensuring equal access to opportunities for all students. Consequently, AI-based tools may contribute towards transforming marketing education in Sri Lanka and could eventually expand globally under the broader framework of AI-driven personalised learning and skill development.

**Keywords:** *Artificial Intelligence (AI), Higher Education, Marketing*

# Reasons for Entrepreneurial Failure amongst Undergraduates: A Case Study on Student Entrepreneurs at Horizon Campus

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## Abstract

The research examines the often-overlooked reasons behind entrepreneurial failures that frequently affect the student communities of entrepreneurs, an emerging class increasingly drawn to startup ventures. While interest among tertiary students is on the rise, many student enterprises face difficulties in surviving during their early phases. Based on surveys, interviews, and case studies, the research identifies lack of funds, insufficient practical experience, inadequate mentoring, excessive academic workload, and poor business planning as contributing factors. Psychological and socio-economic factors, such as the fear of failure, lack of confidence, and a deficit in support structure, are also studied. By addressing these barriers, this research aims to provide a platform for educational institutions, policymakers, and support organisations to collaborate to create an enabling environment for student entrepreneurship. Essentially, this study aims to bridge the gap between entrepreneurial zeal and transitioning to a sustainable business for undergraduates.

**Keywords:** *entrepreneurial failure, student entrepreneurship, financial constraints, psychological barriers, entrepreneurship education*

# Cash on Delivery among Sri Lankan Online Shoppers: A Consumer Study on Colombo District, Sri Lanka

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## Abstract

Sri Lankan e-commerce is advancing, and electronic payments are increasing worldwide; however, cash on delivery remains the primary preference of Sri Lankan online customers over other electronic payment methods. This research aims to identify the primary reasons behind this trend, including low digital literacy, security concerns, and limited access to digital banking and card payments. These are the main determinants of online buyers ' preference for the cash-on-delivery option in Sri Lanka. This study is based on primary data collection through a quantitative method, specifically a structured questionnaire survey conducted with 40 online consumers in the Western Province of Sri Lanka. Cash on delivery is the most popular method in areas such as Colombo and Gampaha, where residents are the most regular online shoppers. The findings of this research will provide an in-depth understanding of consumer behaviour (understanding why people still prefer cash on delivery) and guide e-commerce sites and online shoppers in using digital payment methods.

**Keywords:** *Cash on delivery, digital payments, online shopping, Delivery services*

# Effect of Artificial Intelligence on Digital Marketing Customer Service: A Case Study of Zapier

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**Abstract**

Using Zapier, a top SaaS automation platform, as a case study, this research investigates how Artificial Intelligence (AI) is revolutionising customer service within the framework of digital marketing. Using a mixed-methods approach that incorporates document analysis, user surveys, and secondary data, the study investigates how AI tools, such as chatbots, intelligent automation, and Omnichannel support, enhance operational efficiency, scalability, 24/7 service availability, and personalised user engagement. Critical issues like response accuracy, data privacy, user trust, and the perceived lack of human touch are also studied. According to research, AI effectively improves service delivery and simplifies complex procedures, but its usefulness still depends on careful application that emphasises openness, user-centred design, and ongoing model improvement. To ensure a sustainable and customer-centric integration of AI in digital customer service, the study ends with strategic recommendations for SaaS providers that promote adaptive AI systems and hybrid support models.

**Keywords:** *Artificial Intelligence (AI), Customer Experience, Digital Customer Service, SaaS Platforms, Automation Tools, User Satisfaction*

# The Impact of Attitudes towards Money on the Relationship Between Income and Financial Satisfaction with reference to Colombo District

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**Abstract**

This research examines the impact of attitudes towards money on the relationship between income and financial satisfaction among working adults in the Colombo district of Sri Lanka. Financial satisfaction is shaped not only by objective factors, such as income, but also by subjective ones, including how people perceive, value, and manage money. Previous studies show a clear connection between higher income and greater financial satisfaction. However, recent findings indicate that psychological factors, including attitudes towards money and financial behaviours, can explain why people with similar incomes often experience different levels of financial well-being. Drawing from international literature, especially the work of Gasiorowska (2015); this study examines the role of attitudes towards money in Colombo's socio-economic context. A quantitative research design was used, with structured surveys administered to 384 employed adults. The results show that money attitudes have a significant impact on financial satisfaction. In particular, positive money attitudes, characterised by responsible money management, a focus on financial security, and healthy financial habits, strengthen the link between income and financial satisfaction. Even with the same income levels, individuals who have positive attitudes towards money report higher financial satisfaction than those with less favourable views. Additionally, the findings indicate that the emotional and cognitive aspects of money attitudes serve as mediators and moderators in this relationship. Emotional attitudes towards money, such as a sense of security and confidence, partly mediate how income contributes to satisfaction. The study suggests implementing financial literacy programs, workshops to foster a positive mindset, and awareness campaigns to promote healthy financial attitudes.

**Keywords:** *Money attitudes, Income, Financial satisfaction, Financial literacy, Colombo district*

# The Effect of Social Media Marketing Activities on Brand Loyalty in the Banking Sector among Customers in Sri Lanka.

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**Abstract**

The study examines the influence of social media marketing activities (SMMAs) on brand loyalty in the Sri Lankan banking sector, with a specific focus on the mediating role of brand trust. Social media has become a critical platform for banks to engage with customers, offering two-way communication, customisation, and interactive services. Despite evidence from global studies showing the significance of SMMAs in influencing consumer perceptions, there is a lack of empirical research in the Sri Lankan banking industry. To address this gap, the study examines six dimensions of SMMAs—customisation, entertainment, interaction, trendiness, promotion, and word-of-mouth—and their effects on brand loyalty. A quantitative research design was employed, using structured questionnaires to collect data from 176 banking customers in Colombo. The data was analysed through correlation and regression techniques using SPSS software. Results reveal that SMMAs have a significant positive effect on both brand trust and brand loyalty, with brand trust serving as a strong mediator. Customers who perceive their banks as transparent, reliable, and responsive via social media are more likely to develop loyalty. These findings are consistent with prior research emphasising the role of social media engagement in enhancing customer-brand relationships. Theoretically, this research contributes to social media marketing literature by extending empirical insights into an emerging market context. Practically, it highlights the necessity for Sri Lankan banks to adopt social media as a strategic tool to build trust and sustain long-term loyalty. By focusing on personalised, engaging, and transparent communication, banks can strengthen their competitive advantage in the digital era.

**Keywords:** *Social Media Marketing, Brand Trust, Brand Loyalty, Banking, Sri Lanka*

# Impact Of Workplace Romance on Job Performance among Gen Z Employees in Colombo District

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**Abstract**

This study examines the impact of workplace romance on the job performance of Generation Z workers in the Colombo district. Although workplace romance is very common, it can have both beneficial and detrimental effects in work environments. The study examines how these connections impact worker engagement, productivity, and organisational commitment. A systematic questionnaire was administered to 220 Generation Z employees as part of a quantitative study, and 200 valid responses were analysed. Regression analysis showed that workplace romance accounted for 67.5% of the variance in job performance, revealing a statistically significant positive association between the two ($r = 0.822$, $p < 0.01$). While emphasising against potential risks like favouritism, role conflict, and diminished professionalism, the findings also show how workplace romance can enhance communication, emotional support, and organisational loyalty. The study advances our understanding of Human Resource Management (HRM) by providing valuable guidance on managing romantic relationships at work in a culturally sensitive context.

***Keywords:*** *Workplace Romance, Job Performance, Generation Z, Colombo District, Human Resource Management*

# Impact of Workplace Bullying on the Job Performance of Healthcare Sector Nurses

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**Abstract**

This study investigates the impact of workplace bullying on the job performance of nurses within Sri Lanka's healthcare sector. Workplace bullying is conceptualised through four key dimensions: personal threats, professional threats, workplace isolation, and work inability. This is examined as a critical barrier to nursing efficacy. Adopting a positivist philosophy and a deductive approach, the research employed a cross-sectional survey design. Data was collected via a structured questionnaire from 61 nurses across diverse hospital departments, and analysed using correlation and regression techniques. The findings reveal a significant negative relationship between workplace bullying and job performance, with bullying accounting for 25.2% of the variance in performance outcomes. Among the dimensions analysed, work inability, where bullying directly interferes with task execution, emerged as the strongest predictor of reduced performance. Personal and professional threats also demonstrated moderate negative effects, while workplace isolation, though weaker, remained statistically significant. The results underscore that bullying depletes nurses' psychological resources, leading to diminished productivity, increased strain, and compromised patient care quality. This study highlights the urgent need for institutional interventions to mitigate bullying, particularly by addressing behaviours that directly impede work ability. Recommendations include implementing robust anti-bullying policies, fostering supportive leadership, and introducing resilience training programs. By creating safer work environments, healthcare administrators can enhance the well-being of nurses, improve job performance, and ultimately ensure higher standards of patient care in Sri Lanka.

**Keywords:** *Workplace Bullying, Job Performance, Healthcare Sector*

# Examining the Influence of Flexible Work Arrangements on Employee Innovative Behaviour: Special Reference to IT Industry

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**Abstract**

This study examines the impact of flexible work arrangements (FWAs), particularly flextime and telecommuting, on employee innovative behaviour (EIB) within Sri Lanka's IT industry. Grounded in Self-Determination Theory, the research proposes that FWAs satisfy fundamental psychological needs for autonomy and competence, thereby fostering the intrinsic motivation and proactive engagement necessary for innovation. A quantitative, cross-sectional methodology was employed, utilizing a structured questionnaire, based on established scales, to collect data from 142 IT professionals selected via random sampling. The data was analysed using correlation and multiple regression techniques in IBM SPSS to test the hypothesised relationships. The results demonstrate that both flextime and telecommuting have a statistically significant positive impact on innovative behaviour, which encompasses idea generation, promotion, and implementation. Telecommuting emerged as the stronger predictor, accounting for 49.5% of the variance in EIB, compared to 36.6% for flextime. This indicates that the profound autonomy over work location provided by telecommuting is particularly conducive to the focused, deep work required for creative problem-solving. Practical recommendations include formalising robust telecommuting and flextime policies, investing in digital collaboration infrastructure to maintain connectivity, and urging policymakers to modernise outdated labour regulations to facilitate the broader adoption of FWAs within Sri Lanka's evolving knowledge economy.

**Keywords:** *Flexible Work Arrangements, Flextime, Telecommuting, Employee Innovative Behavior, IT Industry*

# Exploring the Underlying Causes of Payment Delays: A Study on Horizon Campus

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**Abstract**

This study examines the underlying causes of late university fee payments among undergraduate students at Horizon Campus, Sri Lanka. A qualitative research design was adopted, using semi-structured interviews with eight students to gather rich, contextual data, which was analysed thematically. The findings reveal that payment delays are a multifaceted issue stemming from four key themes: a lack of awareness and communication from the institution, students' financial hardships, administrative or technical inefficiencies, and delays in sourcing external funds. Students highlighted insufficient family income, unexpected expenses, slow bank transfers, and delayed loan disbursements as primary contributors. Institutional challenges, such as weak communication channels and rigid payment structures, were found to exacerbate the problem. The study concludes that late payments are not merely a student-level issue but result from a complex interplay of personal, institutional, and systemic factors. Recommendations include adopting student-centred financial policies, such as flexible instalment plans, automated digital reminders, improved coordination with financial institutions, and enhanced financial literacy support for students. This research contributes to the limited body of literature on private higher education finance in Sri Lanka, offering actionable insights for institutional improvement and policy reform.

**Keywords:** *tuition fee delays, financial hardship, higher education, administrative inefficiencies, communication gaps, Sri Lanka*

# The Effect of Organisational Agility on Employee Satisfaction in the IT Industry

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**Abstract**

This qualitative study investigates the role of social media in attracting and retaining members for student clubs at Horizon Campus. Addressing a gap in understanding how platform-specific utility and content strategies influence recruitment, the research employed a case study strategy guided by an interpretivist philosophy. Data was collected through semi-structured interviews with 15 students from various clubs and analysed thematically. The findings reveal that Instagram, WhatsApp, and Facebook serve distinct, non-interchangeable roles in the student engagement lifecycle. Instagram is paramount for visual discovery and building authenticity through complete profiles and behind-the-scenes content. WhatsApp is trusted for official, real-time logistics, but requires peer validation to overcome privacy concerns. Facebook is largely perceived as outdated for general use. Beyond platform choice, the study identifies that psychological barrier, such as imposter syndrome, perceived exclusivity, and privacy concerns, often outweigh technical features in hindering participation. Content that is authentic, low-commitment, and shareable was found to be most effective in overcoming these obstacles. Furthermore, platform effectiveness varies significantly based on club type, student seniority, and cultural background. The study concludes that a successful strategy requires a hybrid, platform-specialised approach.

**Keywords:** *Social Media Marketing, Student Engagement, Higher Education, Digital Communication, Qualitative Research*

# The Impact of Introverted Leadership Styles on Virtual Team Performance in Sri Lanka's Telecommunication Industry

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**Abstract**

This study examines the impact of introverted leadership styles on the performance of virtual teams within Sri Lanka's telecommunications industry. The global shift toward remote work has heightened the importance of leadership styles that are well-suited for digital environments. Although leadership research has traditionally focused on extroverted leaders, this study highlights the unique strengths of introverted leaders, such as reflective decision-making, active listening, and empathetic communication. The research investigates how these traits impact team effectiveness, collaboration, and satisfaction in digitally mediated work environments. A structured, quantitative methodology was employed using a monomethod approach, collecting data from 150 employees working in virtual teams under introverted leaders in the telecommunications sector. The analysis was conducted using SPSS, incorporating descriptive statistics, correlation, and regression. Reliability and validity tests confirmed the strong internal consistency of the measurement scales. The results indicate a significant positive correlation ($r = 0.754$, $p < 0.01$) between introverted leadership style and virtual team performance. Regression analysis further showed that introverted leadership explained 57% of the variance in performance outcomes, validating the hypothesis ($H_1$). The findings suggest that introverted leaders enhance team effectiveness by fostering trust, clarity, and cohesion through careful communication and inclusive collaboration.

**Keywords:** *Introverted leadership, Virtual teams, Telecommunication, Sri Lanka.*

# Impact of Project Work on Employees' Well-Being in the IT Industry

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**Abstract**

Project-based work has become a defining characteristic of modern organisations, especially within the Information Technology (IT) industry, where the need for flexibility, innovation, and responsiveness is paramount. While this work structure can promote creativity and productivity, it simultaneously introduces significant challenges such as increased workload, time pressure, and technical uncertainty, which can negatively affect employee well-being. This quantitative study investigates the combined and individual impact of two critical stressors, project demand and project complexity, on employee well-being within Sri Lanka's IT sector. A structured questionnaire was administered to 125 IT employees involved in project-based roles. Data analysis was conducted using SPSS 27, incorporating descriptive statistics, correlation, and regression analysis. Reliability testing confirmed strong internal consistency, with Cronbach's Alpha values ranging from 0.844 to 0.900. Correlation analysis indicated strong negative associations between project demand and well-being ($r = -0.756$, $p < 0.01$), and project complexity and well-being ($r = -0.833$, $p < 0.01$). Regression results showed that both variables jointly explained 91.7% of the variance in employee well-being ($R^2 = .917$), with project complexity exerting a slightly stronger negative effect ($B = -0.494$, $p < .001$) compared to project demand ($B = -0.392$, $p < .001$). The findings suggest that high project demand (stress, reduced job satisfaction, work-life imbalance) and project complexity (uncertainty, cognitive strain, psychological distress) significantly erode employee well-being in Sri Lanka's IT sector. Managers must use realistic deadlines, reduce role ambiguity, and strengthen support systems and flexible work to sustain health and performance.

**Keywords:** *Project demand; Project complexity; Employee well-being; IT industry; Sri Lanka*

# Sri Lankan Generation Z Undergraduates' Attitudes towards Personal Financial Planning

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**Abstract**

Individual financial planning is the key to achieving personal long-term well-being and financial stability in an era of increasing economic uncertainty and financial complexity. The research examines the attitudes of local Generation Z undergraduates to personal financial planning in the Sri Lankan context. This study will fill this gap by investigating how they perceive the process of financial planning, managing credit, insurance, investments and estate planning. The research bridged the research gap by examining young people in perception and participation in financial planning, credit management, insurance, investment, and estate planning. The study employed a sequential mixed-methods approach, involving a quantitative survey conducted among 300 undergraduates from both government and privately owned universities in Sri Lanka, to ensure a sample comprising participants from diverse disciplines and demographics was obtained. This was then followed by qualitative interviews that investigated any latent cultural and behavioural aspects affecting attitudes towards financial planning. However, there was an apparent reluctance to implement financial plans through the assistance of professionals, which reveals a gap between knowledge and behaviour. Gender differences were observed, as male students demonstrated more progressive attitudes towards investment planning compared to females. Cultural norms influence financial behaviour, necessitating tailored financial education to change it. Against the background of Generation Z tendency towards technologically-advanced solutions, the findings underline the need to implement targeted financial literacy campaigns and digital financial education campaigns. One is to disseminate financial skills using social media and the other is teaching financial planning modules in universities.

***Keywords:*** *Undergraduates, Financial literacy, Sri Lanka, Generation Z, Personal financial planning*

# An Analysis of Barriers to Tourism Growth in Sri Lanka: A Case Study of the Marketing Campaigns

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## Abstract

Tourism is essential for the Sri Lankan economy. It generates jobs in both urban and rural areas, helps to earn foreign currency, and encourages cultural exchange. After the Easter attack and the COVID-19 pandemic years, from 2020 to 2025, the Sri Lankan tourism industry was reestablished with strong marketing campaigns. This study explores the barriers to tourism growth, using different case studies of marketing campaigns in Sri Lanka. In the past years, Sri Lanka has launched several marketing campaigns to enhance its image and attract more visitors. The “So Sri Lanka” and the 2022 “Fall in Love Again” campaigns and their engagement with platforms like Facebook, Instagram, and YouTube have intended to rebuild traveler confidence. In the past year, “You’ll Come Back for More” (2023-2025) became Sri Lanka’s first global campaign after 16 years, targeting key markets such as India, China, the UK, Germany, France, and Australia. In 2025, “A Story for Every Season” aimed to make Sri Lanka a year-round destination and reduce seasonal dips in tourist numbers. Free visas for some countries and promotions of lesser-known places supported these efforts. These attractive themes and international promotions have faced ongoing challenges for tourism in Sri Lanka. Political instability, the aftermath of the 2019 Easter attacks, the COVID-19 pandemic, and the 2022 economic crisis all contributed to negative perceptions that marketing alone could not change. Problems such as weak infrastructure, limited access to new tourist markets, and underused community-based tourism also slowed growth. Sometimes, marketing campaigns did not align with real conditions. They have different visitors' minds and realities. This research provides a close examination of these campaigns within the context of Sri Lanka’s social and economic landscape. It explores what works well and what does not, showing how marketing connects with deeper challenges and why tourism growth is still uncertain, even with positive branding.

***Keywords:*** *Tourism marketing, Barriers to growth, Economic crisis, Destination branding, Cultural exchange*

# The Impact of Virtual Payment Platforms on Impulsive Purchasing Behavior: A Case Study of Koko Pay and Mint Pay

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## Abstract

This research explores the influence of virtual payment platforms, particularly Koko Pay and Mint Pay, on impulsive purchasing behavior. With the increasing adoption of 'Buy Now, Pay Later' (BNPL) services, the ease of deferring payments has led to concerns about its impact on consumer spending habits. The study employs a qualitative approach, conducting semi-structured interviews with five users of Koko Pay and Mint Pay to understand how these platforms shape impulsive buying decisions. Thematic analysis reveals that factors such as the convenience of deferred payments, promotional offers, and ease of use, are significant factors in encouraging impulsive purchasing. Psychological effects, including reduced spending guilt and increased financial anxiety, were noted among participants. The report ends with suggestions for responsible consumer behavior and ethical marketing techniques. It also calls on politicians to regulate BNPL services to protect customers.

**Keywords:** *Impulse purchasing, Koko pay, Mint pay, Purchasing behaviour, Virtual payments.*

# The Impact of Humble Leadership on Employee Agility in Private Sector Apparel Organisations, Colombo District – Sri Lanka

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## Abstract

The apparel industry is one of the most significant contributors to Sri Lanka's economy, generating nearly 43% of the country's export income while employing a substantial portion of the workforce. Given the highly competitive and fast-changing nature of the apparel sector, organisations require employees who can adapt, innovate, and respond effectively to challenges. This adaptability, referred to as employee agility, has been identified as a key factor in enhancing organisational performance and long-term competitiveness. Leadership, particularly humble leadership, plays a crucial role in fostering such agility by creating an environment of trust, transparency, recognition, and psychological safety. Globally, numerous studies have established a positive relationship between humble leadership and employee agility. However, limited attention has been given to this relationship in the Sri Lankan context, particularly within the apparel sector. To address this gap, the present study examines the impact of humble leadership on employee agility in private-sector apparel organisations in the Colombo district of Sri Lanka. The research employed a quantitative, cross-sectional design using a structured, self-administered questionnaire. Data was distributed to 100 executive and non-executive employees, of which 80 valid responses were received, yielding an 80% response rate. The questionnaire collected both demographic details and employee perceptions regarding leadership and agility. To analyse the data, descriptive statistics were used to profile the sample, while reliability analysis ensured internal consistency of the measurement items.

**Keywords**: *Humble leadership, Employee agility, Apparel industry, Organisational performance, Sri Lanka*

# Ethically Crafted Sri Lankan Apparel for Global High Net-Worth Markets

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## Abstract

The global luxury apparel market is undergoing a paradigm shift as High-Net-Worth (HNW) consumers increasingly prioritise authenticity, sustainability, and ethical value creation. This study explores the strategic potential for positioning ethically crafted Sri Lankan apparel within premium fashion segments across Europe, the Middle East, and the United States. Leveraging Sri Lanka's mature apparel ecosystem, renowned for its compliance with international labour and environmental standards, the research investigates how ethical manufacturing can serve as a competitive advantage in penetrating high-value markets. A qualitative, exploratory methodology was employed through field research in Doha and Dubai, incorporating observations and informal interviews at luxury and high-street outlets, such as Dior, Louis Vuitton, Zara, and H&M. The data were analysed thematically to identify patterns in sustainability communication, consumer preferences, and brand positioning. Secondary sources, including sustainability reports and industry benchmarks, supplemented primary findings. Results indicate that Sri Lanka's apparel sector demonstrates exceptional ethical compliance, supported by certifications such as WRAP, GOTS, and ISO 14001, as well as emerging technologies like blockchain-enabled traceability. HNW consumers exhibit a willingness to pay 20–30% premiums for garments combining ethical provenance with luxury-grade design. However, challenges persist in scaling artisanal clusters and upgrading design capabilities to meet global luxury standards. The study recommends a hybrid positioning strategy that integrates artisanal heritage with sustainable luxury textiles, supported by transparent supply chains and digital storytelling. Sri Lanka has a global reputation for ethical, compliant, and high-quality apparel sourcing, as well as being a brand-building destination for luxury and high-net-worth (HNW) consumer markets. This study proposes a vertically integrated startup model—LKA Luxe—that develops, manufactures, and exports limited-edition apparel collections tailored for affluent consumers across the Middle East, Europe, and the USA. The venture leverages Sri Lanka's skilled workforce, sustainability-oriented production environment, and advanced apparel infrastructure to deliver provenance-rich garments distinguished by craftsmanship, material excellence, and full traceability.

**Keywords:** *LUXE / Premium Apparel, Ethical Manufacturing, HNW consumer market, Artisanal Heritage, Natural Craftsmanship*.

# The Impact of Financial Behaviour on Life Satisfaction among Management Undergraduates at Horizon Campus, Malabe

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## Abstract

Financial behaviour is a significant determinant of the overall life satisfaction and well-being of university students, especially those who are entering financial independence. This research examines the effect of financial behaviour on life satisfaction among management undergraduates at Horizon Campus, Malabe, Sri Lanka. Based on the theoretical model proposed by Xiao et al. (2009), this study examines the extent to which financial habits, such as budgeting, saving, and debt management, affect students' financial satisfaction, academic performance, and overall life satisfaction. Employing a quantitative research design, the study will gather data from 200 management undergraduates via a structured survey. The survey will measure key variables, such as financial behaviour (expense management, savings behaviour, and credit usage), financial satisfaction, academic performance (self-reported GPA), and life satisfaction (assessed utilising Diener's Satisfaction with Life Scale). Structural Equation Modelling (SEM) will be used to examine interlinkages between these variables, testing the hypothesis that good financial behaviours improve financial satisfaction, which, in turn, contributes to greater life satisfaction, with academic performance as a mediating variable. The results should reveal that students who practice responsible financial habits experience higher financial security, reduced stress, and improved academic performance, ultimately leading to increased life satisfaction. The research will add to the body of knowledge on financial behaviour and subjective well-being, specifically in Sri Lankan university settings. The study's findings will be useful to policymakers, educators, and students in stimulating efforts towards enhancing financial well-being and overall life satisfaction among undergraduate students.

**Keywords**: Financial behaviour, life satisfaction, academic performance, financial literacy, management students, Sri Lanka.

# The Impact of Influencer Marketing in the Promotion of Tourist Destinations: A Case Study on Sri Lankan Tourism

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## Abstract

The main objective of this study is to gain a clear understanding of the impact of influencer marketing on promoting Sri Lankan tourism. The COVID-19 pandemic and the ensuing economic crisis have severely impacted Sri Lanka's tourism sector. Since the Sri Lankan tourism sector plays a major role in bringing the vital dollar cash inflow into the country, it is the country's third-largest earner of foreign currency. The Sri Lanka Tourism Promotion Bureau (SLTPB) is strengthening its influencer marketing strategy, with a focus on attracting new visitors and boosting Sri Lanka's hospitality sector. Hence, due to the lack of credibility, content strategies and actual influence on tourist decision making pose a significant challenge for local businesses and destination management organisations. The regression models accounted for a very high proportion of variance in the outcome variables, with $R^2$ values above 0.89, indicating robust predictive power. The constructs in this study demonstrated very high internal consistency, as reflected in Cronbach's Alpha scores, with all variables exceeding 0.89. Notably, Attitude Towards Destination (0.947) and Choice of Location (0.956) achieved the highest scores. This confirms that the measurement scales were reliable. KMO values above 0.75 for all variables and significant (Sig) values at $p < 0.000$ confirm that the data were suitable for factor analysis and had high sampling adequacy. Based on the information obtained through those analyses, it became clear that Influencer marketing has an impact and has become an increasingly popular tool for promoting Sri Lankan tourism. Furthermore, the results obtained from the model summary show that its R2 value is 0.893, which indicates that the combination of all variables affects the Choice of location,

***Keywords:*** *Trustworthiness, Expertise, Attractiveness, Similarity, Attitudes towards Posts, Attitudes Towards Destination, Choice of Location.*

# Consumer Behaviour and Shopping Experience in the Sri Lankan Supermarket Industry

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## Abstract

The shopping experience and consumer behaviour in Sri Lankan supermarkets are explored in this paper. An overarching aim is to determine the primary reasons supermarket consumers shop at a store, as well as measure how spontaneous purchase decisions influence buying, and in doing so, explore the impact of sensory marketing. The studies were conducted using simple random sampling. Results show that product quality, service quality, store atmosphere and in-store marketing have a significant positive effect on customer satisfaction and loyalty towards supermarkets in Sri Lanka. The research also examines the moderating effects of demographic and generational factors on these driving factors. The conclusions aim to enable retailers to apply these insights in making their customers more participatory and maximising overall customer experience in an evolving retail environment.

**Keywords:** *Consumer Behavior, Shopping Experience, Store Atmosphere, Impulse Buying, Generational Differences*

# Impact of Online Reviews on Fashion E-Commerce Purchases in Sri Lanka

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## Abstract

This study examines the impact of online reviews on purchasing decisions in the Sri Lankan context of fashion e-commerce. With the growing demand for numerous digital platforms, online customer reviews have come to replace the traditional physical evaluation process for products, as others' evaluations of quality, fit, and style tend to be quite subjective in the fashion industry. In a qualitative approach, data were extracted from semi-structured interviews of three regular online fashion shoppers. The thematic analysis identified four main themes: the frequency and importance of reviews, trust and credibility, the impact of visual content, and the overall effect of reviews on purchase decisions. The results confirm that detailed and credible reviews, particularly those accompanied by photos or videos, significantly enhance consumer confidence. Conversely, negative review recommendations can foster a culture of genuine reviews backed by visuals and actively engaging with customer feedback on review sites to build credibility and consumer trust.

**Keywords:** *Consumer Behaviour, Shopping Experience, Store Atmosphere, Impulse Buying, Generational Differences*

# Characterizing Meteorological Drought Conditions Using the Standardized Precipitation Index: A Case Study in Mapalana, Low Country Wet Zone of Sri Lanka

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## Abstract

Meteorological droughts are among the most pervasive natural hazards, often developing gradually but exerting severe consequences on ecosystems, agriculture, and human livelihoods. In humid tropical regions such as the Low Country Wet Zone of Sri Lanka, where rainfall is typically abundant, the onset of drought is often underestimated until water scarcity becomes critical. This study investigates meteorological drought characteristics in Mapalana, a representative area of this climatic zone, using the Standardized Precipitation Index (SPI). A continuous 33- year monthly rainfall dataset (1990–2022) was analyzed to compute SPI values at multiple timescales (SPI-3, SPI-6, SPI-9, and SPI-12), enabling the identification of both short-term anomalies and longer-term drought patterns. The methodology involved calculating rolling precipitation sums, fitting the gamma distribution to rainfall data using the method of moments, and transforming the cumulative probabilities into standardized normal variates. This statistically robust, computationally efficient approach enabled the detection of drought and wet episodes across multiple temporal scales. The results confirmed that February is the climatologically driest month in Mapalana, while October consistently receives the highest rainfall. Notably, the years 1990, 1991, 2001, and 2002 were marked by extreme drought conditions, particularly evident at the SPI-3 and SPI-6 timescales, while 2015 recorded the highest annual rainfall during the study period. A key finding of this research is the decline in prolonged extreme droughts over the last two decades, suggesting either improved rainfall stability or effective adaptation measures in the region. Nevertheless, moderate droughts remain recurrent, underscoring the importance of continuous monitoring. The multiscale SPI analysis demonstrates its effectiveness as an early warning tool, providing valuable insights for water resource management, agricultural planning, and climate adaptation in humid tropical environments.

**Keywords:** *Meteorological Drought, Standardized Precipitation Index (SPI), Low Country Wet Zone, Rainfall Variability, Drought Monitoring.*

# Attitudes Towards Vertical Farming Practices among University Students: A Qualitative Inquiry

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## Abstract

The growing global population and rapid urbanization necessitate innovative agricultural practices to ensure food security and environmental sustainability. Vertical gardening has emerged as a modern farming technique that utilizes stacked layers and controlled environments to maximize yield within limited spaces. This study explores the attitudes and perceptions of undergraduate students at Horizon Campus, Sri Lanka, toward vertical gardening. A qualitative research design was employed, with data collected through face-to-face semi-structured interviews conducted among 20 students aged 18–24, representing different faculties. The data was analyzed manually using thematic analysis, allowing key patterns to emerge from participant narratives. Findings revealed that while students initially had limited knowledge of vertical gardening, experiential learning opportunities, such as field visits and peer-led demonstrations, significantly enhanced their understanding. Students perceived vertical gardening as a technology-driven, sustainable practice that addresses food security, urban space constraints, and crop diversity. However, participants also identified notable barriers, including high initial costs, limited technical expertise, and reduced adaptability in rural settings. These findings suggest a paradox: vertical gardening is widely acknowledged as beneficial, yet its widespread adoption is hindered by socio-economic and infrastructural challenges. The study concludes that greater emphasis on curriculum integration, policy incentives, and community engagement is needed to promote vertical gardening practices among younger generations. Future research should examine its economic feasibility, scalability in low-income contexts, and integration with emerging technologies such as artificial intelligence and smart irrigation systems.

**Keywords:** *Food security, Student perceptions, Sustainable agriculture, Urban farming, Vertical gardening.*

# Analysis of Monthly Climatic Conditions Based on Moisture Availability Index: A Case Study in Mapalana, Low Country Wet Zone of Sri Lanka

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**Abstract**

Moisture Availability Index (MAI) is the ratio between the 75% probability precipitation based on the analysis of long-term precipitation records and estimated potential evapotranspiration. MAI is a prime factor for crop planning, especially in the tropics, which varies with time and space. The objectives of this study were to find out the nature of months according to the MIA in Mapalana, low country wet zone (LCWZ), Sri Lanka. Also, to find out the sowing period of crops, avoid water stress, and evaluate irrigation need every month of the year. Daily weather data was collected and converted to monthly average weather data to calculate MAI. Potential Evapotranspiration and Dependable Rain Fall were calculated for a long time (30 years). Moreover, the nature of the month was determined. For the Mapalana, LCWZ area, with the collected data set from the weather station situated in the Faculty of Agriculture, University of Ruhuna (19922022), MAI was calculated and the nature of the months at Mapalana area was determined. Results showed higher MAI, excessive moisture from October to November and lowest MAI, very deficient moisture from February to March. There is very deficient MAI in 2 months, moderately deficient in 5 months, somewhat deficient in 1 month, adequately deficient in 2 months and excessive moisture in 2 months. The crop will be normal if it receives moisture, varying from 0.3 to 1 of potential evapotranspiration commencing from germination to completion of the grain formation stage. In conclusion, according to the MAI, variations in the nature of months determine cropping season, crop potential, cropping pattern, land preparations and other management practices.

**Keywords:** *Low country wet zone, Mapalana, Moisture availability index, Nature of months, Potential evapotranspiration*

# Characterizing Climate Change Through Heat Index Trends: A Case Study in the Mapalana, Low Country Wet Zone of Sri Lanka

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## Abstract

Climate change, particularly fluctuations in temperature and relative humidity (RH), significantly influences agriculture. Recent research identifies Sri Lanka as one of the most climate-vulnerable nations globally. Since RH and temperature play vital roles in plant metabolism, growth, and development, variations in these parameters directly affect crop productivity. High RH during nighttime has been shown to increase dry matter production, leaf area, and plant height, while prolonged exposure to high temperature and humidity leads to crop stress. The heat index (HI), which combines air temperature and RH, provides a useful measure of how heat is perceived and the potential stress it places on crops. This study analyzed long-term trends in air temperature, RH, and HI in Mapalana, a representative site in Sri Lanka's Low Country Wet Zone, using 30 years (1992– 2022) of daily meteorological data. Monthly and annual HI values were computed using the Rothfusz regression equation. Results indicated that the annual average temperature ranged from 27.23°C to 29.60°C, while RH ranged from 68.30% to 84.02%. HI values fluctuated from 29°C to 39°C, with 1998 recording the highest value above 39°C. Most years showed an annual HI around 35°C. According to the National Weather Service HI classification, these values fall within the "Caution" (27°C–32°C) and "Extreme Caution" (32°C–41°C) categories, indicating an increasing risk of heat stress for crops and human health. Trend analysis confirmed a gradual increase in HI over the study period, signifying escalating heat stress on crops. These findings highlight the urgent need for climate-resilient agricultural strategies, including heat-tolerant crop varieties and adaptive farming practices. The study further provides critical regional insights that can enhance crop modeling and guide agricultural planning in the Low Country Wet Zone of Sri Lanka.

**Keywords:** *Climate change, Heat index, Low country wet zone, Relative humidity, Temperature*

# Women's Participation in the Adoption and Management of Agricultural Water-Saving Technologies

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## Abstract

Water is a fundamental resource for agriculture, yet its availability is increasingly threatened by climate change, population growth, and unsustainable farming practices. To address these challenges, water-saving technologies such as drip irrigation, sprinklers, and rainwater harvesting have been widely promoted as solutions to enhance productivity while conserving water. However, the adoption and management of such technologies are not gender-neutral. Women, who play a role in agricultural labour and household water use, face structural barriers in terms of decision-making power, access to resources, and training opportunities. This qualitative study examines the participation of women in the adoption and management of water-saving technologies in rural agricultural households. The research explores women's roles, challenges, and contributions by analysing how gender norms and responsibilities shape technology use. Data was collected from 20 participants (10 men and 10 women) through semi-structured interviews, focus group discussions, and questionnaires. The questionnaire focused on five areas: background information, adoption of technologies, participation and management, access and barriers, and perspectives and suggestions. Findings reveal that although men generally dominate formal decisions about adopting new technologies due to control over land and finances, women play a vital role in daily water management, maintain resources for irrigation systems, and monitor crop needs. Women's contributions are constrained by limited access to training, financial resource, and land ownership. Social and cultural norms further restrict their participation in formal decision-making. Nevertheless, women demonstrated resilience and innovation, including reusing household wastewater for irrigation and adjusting planting schedules according to water availability.

**Keywords:** *Gender, Water-Saving, Technologies, Adoption, Agriculture, Decision-Making*

# Exploring Perceptions of University Students on Healthy and Unhealthy Eating: A Qualitative Study on Fruits, Vegetables, and Fast Food Consumption

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## Abstract

University students are at a critical life stage where they gain autonomy over their food choices, which often results in significant changes to dietary habits and may influence long-term health outcomes, including the risk of developing chronic diseases. This study explored the perceptions of healthy and unhealthy eating among undergraduate students at Horizon Campus, Sri Lanka, focusing on fast food, fruits, and vegetable consumption. A qualitative, exploratory approach was used, and twelve students representing all seven faculties participated in face-to-face, semi-structured interviews lasting 20–30 minutes. Data was analyzed manually using thematic content analysis, and responses were grouped into six major themes: general eating habits, perceptions of healthy eating, fast food consumption, fruits and vegetables consumption, behavioral drivers, and attitudes and challenges. The analysis revealed that while students demonstrated a clear understanding of healthy eating, including the importance of balanced meals and nutrient-rich fruits and vegetables, their food choices were predominantly influenced by convenience, affordability, and peer behavior. Fast food was the preferred choice during busy academic schedules, despite awareness of its negative health effects such as gastritis and weight gain. Fruits and vegetables were recognized as essential for good health but consumed irregularly due to higher cost, limited availability on campus, and time constraints. The findings highlight a gap between students' nutritional knowledge and their actual dietary practices. It is recommended that Horizon Campus introduce affordable healthy options, organize nutrition awareness programs, and improve the availability of fresh produce to promote sustainable healthy eating habits among students.

**Keywords:** *Healthy eating, University students, Fast food consumption, Fruits and vegetables, Qualitative study.*

# Understanding Preferences of University Students for Indoor Plant Attributes: A Thematic Exploration

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**Abstract**

This study explores the preferences of university students for indoor plant attributes, focusing on the ways in which plants are perceived, valued, and integrated into student lifestyles. Conducted at Horizon Campus, Sri Lanka, the research employed a qualitative exploratory approach with semi-structured, face-to-face interviews involving eighteen undergraduate students from diverse faculties. Data was analyzed manually through thematic analysis, allowing for the identification of recurring patterns and meanings. Findings revealed that students' preferences were shaped by a combination of practical, aesthetic, and psychological considerations. Compact size, ease of maintenance, and durability emerged as primary drivers of plant choice, with varieties such as snake plants, pothos, and succulents gaining favor due to their low care requirements. Beyond functionality, indoor plants were also recognized for their aesthetic appeal and their capacity to enhance concentration, reduce stress, and create positive living environments. However, challenges such as inconsistent care, inadequate sunlight, pest infestations, and limited knowledge constrained sustained ownership. Students also expressed enthusiasm for innovative solutions such as self-watering pots, reminder applications, and peer-based initiatives that could make plant care more accessible. The study highlights the dual role of indoor plants as both practical household additions and symbolic companions that support student well-being. By situating plant preferences within the context of youth culture, the research contributes to the growing body of work on sustainable lifestyles and environmental psychology in higher education.

**Keywords:** *Aesthetics; Indoor plants; Preferences; Psychological well-being; University students*

# Assessment of the Moisture Availability Index: A Case Study in Mapalana, Low Country Wet Zone of Sri Lanka

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**Abstract**

The intensification of droughts and the uncertainty of moisture variability under rising temperatures and declining precipitation patterns have significantly affected vegetation worldwide. The Moisture Availability Index (MAI)—defined as the ratio between dependable rainfall derived from long-term precipitation records and potential evapotranspiration—serves as a useful tool to evaluate irrigation requirements and assess the sustainability of rain-fed agriculture. This study estimated MAI in Mapalana, situated in the Low Country Wet Zone (LCWZ) of Sri Lanka, using 32 years (1990–2022) of climatic data. Dependable rainfall was calculated using the probability method, while potential evapotranspiration was estimated via the Thornthwaite empirical formula. A crop coefficient of 1.2 for rice (Oryza sativa) was applied to estimate actual evapotranspiration. The results indicate that MAI was relatively high during 1990–1996, had declined moderately from 1997–2001, and remained consistently low from 2002–2019. A temporary increase had occurred in 2020, potentially linked to reduced anthropogenic activities during the COVID-19 pandemic. Overall, findings suggest that the Mapalana region is currently experiencing moisture deficit conditions, which may negatively impact sustainable rice cultivation and water resource management.

**Keywords:** *Dependable rainfall, Evapotranspiration, Irrigation, Low country wet zone, Mapalana, Moisture Availability Index*

# Automative-Low-cost Greenhouse Structure as an adaptable solution for smart urban farming; pathway for sustainable agriculture

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## Abstract

Greenhouses are controlled environments designed to enhance crop quality and yield while reducing the risks associated with climate variability, pests, and diseases. Despite their proven benefits, greenhouse adoption in Sri Lanka and other developing countries remains limited due to high initial costs, lack of technical knowledge, and limited awareness of modern agricultural technologies. This study aims to bridge that gap by designing, constructing, and automating a low-cost, small-scale greenhouse system suitable for urban and semi-urban households with restricted space and resources. The project integrates solar energy, drip irrigation, and IoT-based environmental monitoring to create a sustainable modern greenhouse system. A lightweight reinforced frame covered with UV-resistant polyethylene was used to protect crops from pests and environmental stress. Bell peppers were chosen as the test crop due to their moderate climate needs and economic value. An Arduino Uno controlled irrigation, and monitored soil moisture, soil temperature, and humidity, with real-time data shown on an LCD display. When soil moisture dropped below the set threshold, a buzzer-activated drip irrigation system automatically operated. Solar panels powered LED grow lights and a ventilation fan, ensuring optimal growing conditions with minimal human intervention. The greenhouse was implemented in the Kandy District in Sri Lanka's Central Province, where the tropical highland climate (20°C–28°C, 2,000–3,000 mm annual rainfall) supports bell pepper cultivation. However, greenhouse-grown bell peppers may not perform well in regions with high humidity or temperatures above 30°C, hence local climate suitability must be considered before adoption. The system improved water-use efficiency, reduced reliance on chemical fertilizers, and produced healthier organic crops. It also minimized manual labor, saving time and energy.

**Keywords:** *Low-Cost, Greenhouse, Automation, IoT (Internet of Things), Solar Energy, Sustainable Agriculture*

# Critical Engagement and Ethical Awareness in the Use of Artificial Intelligence among Undergraduates in Sri Lanka

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## Abstract

The rapid integration of Artificial Intelligence (AI) in higher education offers opportunities for personalised learning and enhanced academic productivity, yet it also raises concerns regarding ethical use and critical engagement. This study investigates how undergraduate students in Sri Lankan universities engage with AI tools, with particular focus on ethical awareness and strategic learning practices. A quantitative design was employed using a structured questionnaire administered to 100 undergraduates representing diverse disciplines and socio-economic backgrounds. The instrument captured demographic information, digital literacy, patterns of AI use, and indicators of critical engagement and ethical awareness. Responses were analyzed through descriptive and inferential statistics to identify relationships among digital literacy, ethical considerations, and strategic learning behaviors. Findings reveal that most respondents possess moderate-to-high digital literacy and reliable internet access, and they generally perceive AI as academically beneficial. However, actual engagement with AI tools such as ChatGP, and Quillbot is often superficial. Only a smaller subset of students critically evaluates AI outputs or integrate them into independent reasoning. Ethical awareness—particularly concerning plagiarism, bias, and data privacy—was reported by a majority of participants; however, this awareness has not consistently translated into responsible practices, such as proper citation or systematic bias checking. The research concludes that while Sri Lankan undergraduates are optimistic about AI's potential, critical engagement remains limited. To transform AI from a convenience tool into a catalyst for higher-order learning, universities should implement AI-literacy curricula, establish clear ethical policies, train faculty to mentor responsible usage, and improve equitable digital access. Thus, such initiatives will enable students to harness AI for reflective, ethical, and strategic learning, ensuring that AI serves as an enabler of cognitive development rather than a shortcut to academic outcomes.

**Keywords:** *Artificial Intelligence, Higher Education, AI Engagement, Critical Engagement*

# Evaluation of the Combined Antibacterial Activity of *Azadirachta Indica* and *Munronia Pinnata* Plant Extracts

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## Abstract

The rapid increase in infectious diseases necessitates the ongoing need for the development of novel antimicrobial medications with unique chemical compositions and modes of action. The primary objective of this study was to assess the individual and combined antibacterial efficacy of leaf, bark, and roots extracts of Azadirachta indica and Munronia pinnata. The presence of secondary metabolites was assessed through a qualitative phytochemical analysis, which revealed, compounds such as phenols, tannins, flavonoids, saponins, terpenoids, and alkaloids. These findings were further confirmed by thin-layer chromatography (TLC) analysis. The antimicrobial susceptibility test was performed using the EUCAST disk diffusion assay against Escherichia coli (ATCC® 25922™), Staphylococcus aureus (ATCC® 25923™), Bacillus cereus and Pseudomonas aruginosa (ATCC® 27853™). Extracts from both plants showed significant antibacterial activity exception against E. coli, probably due to its protective outer membrane. When combined the plant extracts showed an antagonistic effect against S. aureus and a synergistic effect against B. cereus and P. aeruginosa. However, an antagonistic effect was observed when the extracts were combined with Gentamycin (positive control), likely due to interference with the antibiotic's mechanism of action. Among the tested extracts, A. indica leaves exhibited the highest zone of inhibition with a diameter of 17.00 ± 0.141 mm against S. aureus indicating potential as an alternative to Gentamicin in cases of antibiotic resistance. Overall, this study lays a foundation for future studies into the therapeutic potential of natural sources and the discovery of novel antimicrobial agents.

**Keywords:** *Antibacterial activity, ethnopharmacology, secondary metabolites, antibiotic resistance*

# Guardians of Medicinal Plant Diversity in Sri Lanka: The Cultural Role of Traditional Healers in on-farm and Wild Germplasm Preservation

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## Abstract

Traditional healers in Sri Lanka, including Ayurveda, Siddha, and Deshiya Chikitsa practitioners, play a crucial role in conserving medicinal plant diversity by safeguarding both wild and on-farm germplasm. Recent studies from 2020 to 2025 highlight increasing threats to Sri Lanka's medicinal flora, such as overharvesting, habitat loss, and climate change, emphasizing the importance of traditional knowledge in sustainable conservation. This study aims to synthesize recent literature on the role of Sri Lankan traditional healers in medicinal plant conservation and to identify key threatened species. It also assesses how indigenous knowledge contributes to their preservation, and explore cultural and ecological practices that support germplasm maintenance in home gardens, sacred groves, and community landscapes. The methodology involved a systematic review of selected peer-reviewed articles, ethnobotanical surveys, and conservation reports obtained from academic databases like PubMed, Google Scholar, and Sri Lankan repositories, focusing on publications from 2020 to 2025. Thematic analysis of the selected literature revealed that traditional healers conserve important species such as *Salacia reticulata*, *Hemidesmus indicus*, and *Asparagus racemosus* through sustainable harvesting, cultivation in home gardens, and sacred rituals. Community-driven efforts, such as the Nagenahiru Foundation's medicinal plant arboretum, exemplify successful propagation and knowledge transmission models. Nonetheless, challenges remain in integrating traditional practices with formal conservation frameworks, including ex-situ and in-situ strategies. The review concludes that traditional healers are vital cultural custodians of medicinal plant diversity in Sri Lanka, and strengthening collaboration between indigenous knowledge holders and scientific conservationists is essential for ensuring sustainable germplasm preservation and safeguarding this rich botanical heritage for future generations.

**Keywords:** *Medicinal plant conservation, Traditional healers, Sri Lanka ethnobotany, on-farm germplasm preservation, Indigenous knowledge systems*

# The Impact of the Optimized Surface Sterilization Protocol on Phytochemical Availability in Leaf and Nodal Explants of *Atlatia Ceylinica*: A Tissue Culture-Based Study

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## Abstract

*Atalantia ceylanica*, a renowned Sri Lankan medicinal plant, is widely used in traditional treatments, particularly for diabetes and respiratory disorders. This study aimed to optimize a surface sterilization protocol for leaf and nodal explants and to compare the phytochemical availability between surface-sterilized and non-sterilized tissues. The research was conducted at the Faculty of Science, Horizon Campus, using plant tissue culture techniques. Optimized explant sterilization protocol, includes rinsing the explants with 10–15% Clorox for 15 minutes followed by 70% ethanol for 1 minute. The optimized sterilization protocol successfully reduced contamination from 10% to 0% in nodal explants and from 8% to 0% in leaf explants, enabling the establishment of viable cultures. Shoot initiation reached 70% on hormone-free Murashige and Skoog (MS) medium. Preliminary phytochemical screening was performed using sequential extraction with hexane, ethyl acetate, and methanol. Alkaloids and phenols were predominantly observed in nodal tissues, while flavonoids, tannins, and saponins were more abundant in leaf tissues. Alkaloids and phenolic compounds were detected in 80% of surface-sterilized nodes, whereas 75% of non-sterilized leaves showed flavonoids and tannins. No terpenoids were detected in any treatment. Further, replicates and the quantitative phytochemical analysis are required to validate and expand these preliminary findings, contributing to standardized propagation and phytochemical profiling of *A. ceylanica*.

**Keywords:** *Atalantia ceylanica, Surface sterilization, Phytochemical analysis*

# Development of a Wound Healing Cream from *Lawsonia Inermis L*. and *Allium Cepa L*.

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## Abstract

This research explores the potential of *Lawsonia inermis* L. (henna) and *Allium cepa* L. (onion) in wound healing by extracting and analyzing their phytochemical compositions and evaluating their antimicrobial properties. Both plants have been traditionally used for medicinal purposes due to their wound healing and antimicrobial properties. The process involved sequential extraction, phytochemical analysis, thin-layer chromatography (TLC), and antimicrobial assays to identify the presence of various bioactive compounds and their effectiveness against common pathogens. Results indicated a significant abundance of these compounds, particularly in methanol extracts, suggesting their potential in wound healing and antibacterial applications. TLC profiling revealed distinct chemical bands, confirming the presence of specific compounds such as flavonoids, alkaloids, tannins, phenols, steroids, saponins, and terpenoids in both *Lawsonia inermis* and *Allium cepa*. *Lawsonia inermis* showed inhibition zones of 8.95 mm against *E. coli* and 9.44 mm against *Staphylococcus aureus*, while *Allium cepa* exhibited 8.24 mm against *E. coli* and 12.67 mm against *Staphylococcus aureus*. These results indicate strong antibacterial activity, supporting their potential in wound healing applications. The study also involved the formulation of wound healing creams, with the most effective formulation demonstrating a balanced combination of these extracts. This research offers valuable insights into the phytochemical profiles and antimicrobial properties of *Lawsonia inermis* and *Allium cepa*, supporting their use in the development of effective wound healing creams.

**Keywords:** *Wound healing, Lawsonia inermis L., Allium cepa L., Phytochemicals, Antimicrobial*

# Investigation of Starch Degrading Enzyme Activity of Isolated Soil Bacteria on Different Starch Substrates

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## Abstract

Amylases, which are essential in biological and industrial applications, are enzymes that break down complex starch into simpler sugars like glucose and maltose through hydrolysis. Due to their stability, ease of production, and ability to operate under a wide range of environmental conditions, microbial amylases are preferred in industrial applications. This study aimed to identify commonly available and cost-effective substrates that support the optimal growth of starch-degrading soil bacteria and promote the production of amylase. Pure soil bacterial isolates were obtained by sequential streaking on nutrient and starch agar plates. All three substrates i.e. potato, cassava and rice, showed the highest mean enzyme activity at 48 hours after incubation, followed by a gradual decline in activity over time. Potato supported the highest glucose production during the first 48 hours, indicating rapid enzymatic breakdown. Both Potato and Cassava maintained positive enzyme activity up to 72 h. Rice produced the lowest glucose levels throughout, implying limited enzymatic accessibility under the conditions tested. These results highlight the importance of the choice of starch substrate and the timing of enzymatic conversion for desired outputs to scale up microbial enzyme production.

**Keywords:** *Alpha Amylase, Starch-degrading enzymes, Starch substrates, Soil bacteria*

# Integrated Cyber Operations Toolkit: A Smart Platform for Ethical Hacking with AI Automation

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**Abstract**

Cybersecurity professionals face significant challenges due to tool fragmentation, requiring expertise across multiple specialized platforms for comprehensive security assessments. Traditional approaches separate offensive tools like Metasploit from defensive platforms such as OpenVAS, creating workflow inefficiencies and potential security gaps. Current solutions force security professionals to spend approximately 60% of their time on tool coordination rather than strategic analysis, contributing to workforce burnout and reduced effectiveness. This research proposes developing a unified cybersecurity platform that integrates both offensive and defensive capabilities with AI-enhanced automation for intelligent vulnerability assessment and reporting. The system leverages machine learning algorithms for automated vulnerability detection, natural language processing for report generation, and unified data correlation across security domains. Using Python-based development with integrated security tools, AI frameworks, and cloud deployment, the platform addresses fragmentation issues while providing intelligent automation. The study validates integration benefits through empirical evaluation, measuring assessment completeness, efficiency, and user satisfaction against traditional multi-tool approaches. Outcomes demonstrate significant improvements in operational efficiency while maintaining comprehensive security coverage, positioning organizations to enhance cybersecurity posture through more accessible and effective security assessment capabilities.

**Keywords:** *Cybersecurity Integration, AI Vulnerability Assessment, Automated Penetration Testing, Unified Platforms, Intelligent Reporting.*

# An Intelligent Plant Identification System with Integrated Agricultural Marketplace and Communication Platform

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**Abstract**

Many people cannot recognize herbal plants when they see them. This creates problems when they want to grow these plants, buy them, or use them for medicinal purposes. Current applications only offer one option - they either identify plants or help people buy plants or give advice about plant care. No application offers all three options together. Our project creates a mobile application that uses AI to identify herbal plants through camera photos and helps buyers purchase herbal plants from local sellers. The application includes an intelligent chatbot that helps buyers and sellers communicate with each other. We use machine learning technology called CNN (Convolutional Neural Networks) to identify over 90% of herbal plants accurately. The application is built using React Native so it works on both Android and iPhone devices. We use cloud technology to store data and make the app work quickly. This is the first application that combines herbal plant identification, an online herbal plant marketplace, and smart chat features in one place. The application helps people learn about herbal plants, connects buyers with nearby herbal plant sellers, and makes buying herbal plants easier. Our research fills an important gap because no other app offers all these features together for herbal plants specifically. This will help people interested in herbal medicine and herbal plant farmers connect better and make herbal plant identification accessible to everyone.

**Keywords:** *Herbal Plant Identification, Mobile App, AI Technology, Herbal Plant Marketplace, Chatbot*

# Energy Map: Forecasting Electricity Demand with Nature-Inspired Optimization

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**Abstract**

Accurate electricity demand forecasting is vital for grid reliability, cost reduction, and efficient energy management. This study proposes Energy-Map, a hybrid forecasting framework that integrates Long Short-Term Memory (LSTM) networks and XGBoost regression models, combined with nature-inspired optimization algorithms such as Particle Swarm Optimization (PSO) and Genetic Algorithms (GA) to enhance prediction performance. Temporal, socio-economic, and seasonal features were engineered to capture the multifaceted influences on electricity consumption. The proposed system utilizes LSTM to model sequential and temporal dependencies, while XGBoost captures non-linear interactions among input variables. PSO and GA are employed to systematically optimize the hyperparameters of both models, overcoming traditional gradient-based limitations and achieving robust convergence across diverse data scenarios. The Energy-Map framework is deployed on a real-world dataset comprising hourly electricity consumption data, weather conditions, and socio-economic indicators. Performance was assessed using classical metrics including Root Mean Squared Error (RMSE), Coefficient of Determination ($R^2$), Mean Absolute Error (MAE), and Mean Absolute Percentage Error (MAPE). The hybrid system exhibited significant improvements over individual models, with RMSE and MAPE reductions of 12.3% and 9.7% respectively, and achieved an $R^2$ of 0.97. Furthermore, the system was validated for billing cost estimation, maintaining an average error margin of just 3.2% compared to actual invoiced amounts. These findings highlight the advantages of hybrid and nature-inspired optimization in electricity demand forecasting, contributing to more resilient, economically efficient, and sustainable energy ecosystems.

**Keywords:** *Electricity Demand Forecasting, LSTM, Genetic Algorithms, Particle Swarm Optimization, Xgboost*

# A Collaborative Filtering Approach Using Singular Value Decomposition for Movie Recommendations

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**Abstract**

The main service of the online platforms of Netflix, Amazon Prime Video, and YouTube is to provide their customers with thousands of viewing options daily. Such diversity increases accessibility but often leads to information overload and decision fatigue. This paper is a research proposal to develop a movie recommendation system by means of collaborative filtering via Singular Value Decomposition (SVD). The system has been trained on the MovieLens 100K data that included 943 users, 1,682 movies, and 100,000 ratings. Preprocessor data was preprocessed using sparsity reduction, rating normalization, and performance enhancement techniques. The user-item matrix was factorized employing SVD to elicit latent features, which capture the inclination of the user and item features. Model training and testing were carried out through the Surprise library of Python. Performance evaluation was based on Root Mean Square Error (RMSE) and Mean Absolute Error (MAE). The results indicated an RMSE of 0.91, which is superior to traditional user and item-based collaborative filtering strategies. The researchers indicate that SVD can be scaled and can handle sparse data, thus it is suitable in academia and for small to medium scale. Future research will involve hybrid networks, and future collaborations will focus on the hybrid networks that are a combination of collaborative filtering with content-based features and contextual features and deep learning embeddings, in order to enhance the cold-start performance and responsiveness to changing user preferences.

***Keywords:*** *Collaborative-Filtering, Machine-Learning, Recommendation-Systems, SVD, Matrix-Factorization*

# Real-Time Alert Mechanisms in an IoT-Enabled Smart Medication Monitoring System Using a Pill Box and Liquid Bottle.

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**Abstract**

Non-adherence to medicine is a significant health care issue, especially among geriatric and chronic care patients, and its prevalence rates are estimated at 40-50. This results in much worse health care and health expenditure. Current options, including simple pillboxes, do not include real-time monitoring features, and intelligent dispensers available in the market do not necessarily support liquid drugs and multi-user features. To fill in these gaps, this paper has suggested a new cost-effective hybrid platform based on Arduino/Raspberry Pi microcontrollers. The system consists of the integration of a smart pillbox and a liquid dispenser using an ultrasonic flow sensor to measure the liquid accurately. It allows real-time tracking through cloud connectivity and sends multi-modal notifications (LED, SMS, and wearable alerts) to remind the user. The strategy is expected to be far better than traditional tactics, relying on past studies that show an increase in adherence of more than 20% with the use of similar IoT tools. The suggested system will be scalable, patient-centered, and affordable, and it will be a platform on which additional adherence and access optimization tools can be added, such as AI-driven reminders, blockchain security, and voice control.

**Keywords:** *Visuals Alerts (LED), Auditory Alerts (Buzzers), Tactile Alerts (Wearable Vibrations), SMS, App Notifications.*

# A Predictive Analysis of Career Success Factors: Model Development & Evaluation

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**Abstract**

This study applies machine learning to predict career success based on education and skills-related data. Using a GitHub dataset of 5,000 individuals from global education and employment records, the research evaluated three predictive models: Logistic Regression, Random Forest, and XGBoost. Among them, XGBoost achieved the highest accuracy (46%), outperforming Random Forest (39.62%) and Logistic Regression (26.48%). The most significant predictors of career success were university GPA, internships, certifications, and soft skills, whereas high school GPA and university ranking showed minimal impact. Additionally, a Flask-based web application was developed to provide users with personalized job-level predictions based on their educational and experiential profiles. The study offers practical implications for universities, students, and employers by supporting evidence-based decision-making in academic advising, skill development, and recruitment. It contributes to educational data science by demonstrating how predictive analytics can uncover the multifaceted nature of career success and guide data-driven policy interventions to improve employability outcomes.

**Keywords:** *Career Success, Machine Learning, Predictive Modeling, XGBoost, Career Guidance*

# Machine Learning Models for Exoplanet Detection: A Comparative Analysis

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**Abstract**

The exponential growth of stellar photometric data from missions such as Kepler and TESS necessitates robust, scalable, and interpretable exoplanet detection frameworks. This study presents a comparative evaluation of traditional machine learning and deep learning approaches for automated exoplanet identification. Specifically, XGBoost models were examined utilizing engineered statistical features against convolutional neural networks (CNNs) trained directly on raw light curve data. To address severe class imbalance inherent in astronomical datasets, focal loss optimization was applied to CNNs, while Gradient-weighted Class Activation Mapping (Grad-CAM) was integrated for interpretability and bias detection. The experimental framework employed 5,087 Kepler Objects of Interest (KOI) from the Kepler mission dataset. Results revealed marked performance disparities when metrics beyond overall accuracy were considered. The CNN achieved 96.15% overall accuracy but failed on the critical minority class of confirmed exoplanets, yielding only 1.71% precision and 6.81% recall. This weakness highlighted its tendency toward false negatives, risking the omission of genuine planetary candidates. In contrast, the XGBoost classifier, leveraging domain-specific features, achieved superior class performance with 87% precision and a balanced F1-score of 0.87. Grad-CAM visualizations further provided insights into CNN decision-making, revealing potential biases and emphasizing the importance of human-in-the-loop validation in astronomical applications. The findings demonstrate that overall accuracy can be misleading in rare event detection. For tasks where minority class identification is scientifically critical, traditional machine learning with expert feature engineering outperforms end-to-end deep learning approaches. These results highlight the necessity of combining performance with interpretability to build scientifically trustworthy AI- AI-assisted discovery systems. The study advocates transparent, interpretable models supported by human oversight to ensure reliable exoplanet detection in the era of big astronomical data.

**Keywords:** *Exoplanet Detection, Machine Learning, Class Imbalance, Explainable AI, Kepler Mission.*

# Why Do People Ghost? A Large-Scale Study of Online Dating Experiences

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**Abstract**

Ghosting, the sudden and unexplained disappearance of communication, has become a prevalent challenge in digital dating. This study addresses research gaps by analyzing survey data from 11,500 dating-app users, representing the largest dataset on ghosting to date. Findings reveal that half of the participants had been ghosted, while one in four admitted to ghosting others, typically infrequently. Age, gender, and sexual orientation showed modest differences, and activity measures (messages, emojis, app usage time) were weak predictors. Instead, ghosting appears shaped by relational investment, personal beliefs, and conflict avoidance. Interpreted through Social Exchange Theory, Uncertainty Reduction Theory, and Attachment Theory, ghosting emerges as both a rational choice and a socially costly act. Perpetrators minimize effort while recipients experience uncertainty and emotional distress. The study connects ghosting to ostracism theory, highlighting parallels to social exclusion. Practical recommendations include platform nudges encouraging closure, digital etiquette education, and design changes reducing choice overload. This research advances understanding of ghosting as a modern relational phenomenon by combining unprecedented scale with established theories, offering actionable pathways for healthier online interactions and improved user well-being in digital dating environments.

**Keywords:** *Ghosting, Online Dating, Digital Communication, Relational Theories, Social Exclusion.*

# AI-based Network Intrusion Detection System (AI-based NIDS)

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**Abstract**

In the face of cyber threats, cybersecurity has become a major concern in today's digital world, especially in commercial and government networks. Since traditional signature-based intrusion detection systems (IDSs) rely on predefined patterns, they are unable to detect new or evolving threats. To overcome these limitations, a research paper presented an artificial intelligence (AI)-powered network intrusion detection system (NIDS) that combines machine learning and deep learning techniques to achieve greater accuracy, adaptability, and faster threat detection. The system uses supervised and unsupervised algorithms such as random forests, support vector machines (SVMs), and long short-term memory (LSTM) networks to accurately classify network data. Benchmark datasets like nsl-kdd and unsw-nb15 were used along with metrics such as precision, accuracy, recall, and F1 score for training and evaluation. To speed up the detection and increase the performance, a feature selection method was employed. A comparative experiment reveals that machine learning (ML) models are still efficient and simple to understand; however, deep learning models (LSTMs) can achieve better results in terms of accuracy and adaptability than traditional machine learning models. The proposed method has superior detection capabilities to conventional intrusion detection systems (IDS); thus, it is a scalable and intelligent solution that enhances network security and contributes to SDG 16: peace, justice, and strong institutions.

**Keywords:** *Intrusion Detection System, Cyber Security, Artificial Intelligence, Machine Learning, Network Security.*

# A Gamified Mobile Framework to Enhance Homework Compliance in Sri Lankan Primary Education

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**Abstract**

Homework plays a crucial role in reinforcing classroom learning and developing essential skills among primary school students. However, in many Sri Lankan government schools, homework compliance remains low due to limited parental involvement, low student motivation, and inadequate monitoring mechanisms. This study proposes a conceptual framework for a localized and gamified mobile application designed to improve homework compliance in primary education. A systematic literature review was conducted using Google Scholar, focusing on studies related to homework practices, parental engagement, mobile learning, and user-centered educational technologies. Findings indicate that parental participation, contextualized digital tools, and culturally adaptive designs are critical to enhancing student commitment. The proposed mobile framework integrates parental monitoring, teacher feedback, gamified motivation, and offline functionality to address technological and literacy barriers in rural schools. By combining family–school collaboration theories with mobile learning principles, the framework fosters stronger teacher–parent–student connections and continuous feedback loops. This study's novelty lies in integrating gamified motivation, cultural localization, and policy alignment within a single model to promote sustainable homework engagement. Future work will focus on developing and pilot-testing the proposed application to evaluate its impact on student performance and parental involvement.

**Keywords:** *Homework Compliance, Mobile Learning, Parental Involvement, Primary Education, Educational Technology.*

# Designing an AI Framework to Predict Real-Time Online Learning Comprehension Among Undergraduates

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**Abstract**

Effective real-time procedures to evaluate student understanding are more important now than ever before due to the growing popularity of online learning in higher education, especially in the post-pandemic period. Teachers can see non-verbal clues like facial expressions and behavioral reactions in traditional classroom settings, which are mostly missing in virtual ones. This study suggests creating a multimodal Artificial Intelligence (AI) framework that combines response accuracy and facial expression analysis to forecast undergraduate students' real-time understanding. Based on learning analytics and affective computing, the study uses a mixed-methods approach, collecting and analyzing qualitative and quantitative data simultaneously using a convergent parallel architecture. Quantitative data were acquired from 384 lecturers through structured questionnaires and 147 undergraduate students through an online learning platform designed expressly for this project. Semi-structured interviews with 15 lecturers were conducted to explore pedagogical insights and ethical considerations.

**Keywords:** *Artificial Intelligence, Comprehension Prediction, Facial Landmark Analysis, Multimodal Learning Analytics, Online Education.*

# Real-Time Paddy Field Monitoring in Sri Lanka: A Conceptual Review and System Proposal Using IoT, UAVs, and Machine Learning

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**Abstract**

Rice cultivation plays a central role in Sri Lanka's food security, yet most paddy farmers still depend on manual observation to detect diseases, pest infestations, and irrigation issues. These traditional practices are labor-intensive, subjective, and often delay interventions that could prevent yield losses. This paper presents a conceptual review and system proposal that explores how the integration of Internet of Things (IoT) sensors, unmanned aerial vehicles (UAVs), and machine learning (ML) can modernize crop monitoring for Sri Lankan conditions. Drawing on recent international research, the study reviews the performance and limitations of IoT-enabled environmental sensing, UAV-based imaging, and convolutional neural networks (CNNs) for plant-health assessment. It identifies key challenges, particularly cost, data localization, and scalability, that constrain direct adoption in smallholder-dominated contexts. Building on this review, the paper proposes a three-layer architecture combining IoT sensor networks, UAV imagery, and locally trained CNN models for early anomaly detection. Rather than presenting implementation results, the study provides a roadmap for future pilot validation using local datasets and defined performance metrics. The proposed framework aims to guide research and policy toward affordable precision-agriculture solutions that enhance productivity, sustainability, and resilience in Sri Lanka's paddy sector.

**Keywords:** *Internet Of Things, Unmanned Aerial Vehicles, Machine Learning, Convolutional Neural Networks, Precision Agriculture, Paddy Field Monitoring.*

# Scalable Big Five Personality Prediction: A Machine Learning System with Million-Scale Validation and Web Deployment

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**Abstract**

Personality assessment remains subjective and resource-intensive, limiting scalability in psychology, education, and human resources. This study presents a machine learning system for automated Big Five personality trait prediction (extraversion, neuroticism, agreeableness, conscientiousness, openness), addressing these limitations through large-scale validation and practical deployment. Three contributions are made: First, the IPIP-FFM dataset is processed (1,011,478 responses) with systematic preprocessing including median/mode imputation, z-score standardization, winsorization (1st/99th percentile), and PCA dimensionality reduction (60→55 features, 95% variance retained). Training utilized 809,182 samples (80/20 stratified split) with 3-fold cross-validation. Secondly, a comprehensive evaluation of five algorithms demonstrates that LightGBM achieves 97.6% classification accuracy across all traits (EXT: 97.6%, NEU: 97.6%, AGR: 97.5%, CON: 97.6%, OPN: 97.7%), outperforming Random Forest (89.1%), XGBoost (91.1%), SVM (85.2%), and Logistic Regression (82.0%) by 8.5–15.6 percentage points, representing 85 fewer misclassifications per 1,000 assessments. Random Forest excels at regression ($R^2$=0.969). Thirdly, a Streamlit-based application was deployed, enabling real-time prediction through 20 questions (80% reduction from standard 100+ item inventories), with each item mapped to trained IPIP features. This work integrates million-scale empirical validation, production-grade implementation, and accessible deployment elements rarely combined in prior research. Results position machine learning as a scalable alternative to traditional psychometric assessments, with implications for recruitment automation, personalized educational guidance, and mental health screening.

**Keywords:** *Personality Assessment, Big Five Model, Machine Learning Classification, Large-Scale Validation, Automated Prediction.*

# Development of a Cloud-Based Electronic Blood Bank System Web App

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**Abstract**

This research presents the design and development of a cloud-based electronic blood bank management system that enhances efficiency, transparency, and real-time coordination among blood banks, hospitals, and donors. Traditional systems often rely on fragmented, manual processes that delay emergency responsiveness and lead to inefficient resource utilization. The proposed system integrates Firebase for real-time synchronization, React.js for user interfaces, and Node.js for backend services. It features centralized blood inventory tracking, automated alerts for low stock and expiry, secure donor registration, and role-based access control. During prototype testing, the system demonstrated an average response time of 2.7 seconds, 98% data synchronization accuracy, and 85% positive user satisfaction based on survey feedback. These findings confirm its potential to improve operational speed and data reliability compared to existing methods. By incorporating robust data encryption, multi-factor authentication, and compliance with healthcare data standards (HL7/FHIR), the system supports both scalability and data security. Overall, this research highlights how cloud-based platforms can transform blood bank management by providing reliable, efficient, and secure digital infrastructure.

**Keywords:** *Cloud-Based System, Blood Bank Management, Real-Time Tracking, Data Security, Healthcare Interoperability.*

# AI-Powered Mental Health Support for Undergraduates

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**Abstract**

University students in Sri Lanka face a range of persistent mental health issues arising from social pressures, financial difficulties, and academic stress. Due to social stigma, the high cost of professional counselling, and limited access to help, many undergraduates are reluctant to seek professional counselling even when they are faced with such issues. Providing accessible, affordable, and privacy-preserving mental health support with artificial intelligence can increase the effectiveness of addressing these issues. This study presents an AI-powered mobile application that helps university students in Sri Lanka manage their stress and anxiety. The application provides personalized emotional support through chat-based interactions, mindfulness exercises, mood tracking, motivational content, and stress-relieving games, all of which are integrated with Sinhala language data and the LLaMA large language model. By incorporating Sinhala and Natural Language Processing (NLP), the app ensures that content is delivered in an emotionally and culturally sensitive manner while protecting user privacy. By providing localized AI-driven mental health support, the proposed solution seeks to reduce barriers to help, encourage early intervention, and increase students' resilience.

**Keywords:** *AI, Chatbots, Mental Health, Undergraduate, Sinhala.*

# Design and Evaluation of an AI-Based Virtual Driving License System with Facial Recognition Prototype for Driver Identification in Sri Lanka

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**Abstract**

This project presents an integrated Digital License Management System for streamlining license verification and fine management in Sri Lanka. Traditional manual processes are time-consuming, error-prone, and inefficient. The proposed solution leverages React, TypeScript, Vite, and TailwindCSS to deliver a user-friendly, responsive interface with digital license verification, fines management, driver appreciation mechanisms, and analytics dashboards. User testing with five participants demonstrated a 100% task success rate with a mean completion time of
2.3 minutes and a usability rating of 4.4/5.0 across desktop, tablet, and mobile platforms. The platform is production-ready and recommended for immediate deployment. A facial recognition prototype was developed as proof-of-concept for identity verification, employing a multi-stage pipeline with face detection, preprocessing, feature extraction, and classification using InsightFace and machine learning classifiers (SVM, Random Forest, KNN, Logistic Regression). The prototype was evaluated on 70 images from seven individuals using an 80-20 train-test split with 5-fold cross-validation. Results showed 97% training accuracy but only 60% test accuracy (37-percentage-point gap), indicating substantial overfitting from the small, imbalanced dataset. Class-specific performance ranged from F1=0.94 to F1=0.55, revealing significant bias toward well-represented individuals. The facial recognition component is a preliminary prototype with limited accuracy and is not production-ready. Comparison with production systems (89–95% accuracy) confirms the need for substantial improvement. The primary contribution is the fully functional digital license management platform. The facial recognition module remains exploratory, requiring data augmentation to 200+ images per individual, improved feature extraction, multi-factor authentication combining facial recognition with national ID verification, and government database integration for potential large-scale deployment in Sri Lanka's traffic enforcement context.

**Keywords:** *Digital License, License Verification, Facial Recognition, Machine Learning, Computer Vision.*

# Comparison analysis for Agentic AI-Powered Smart DevOps Assistant for Autonomous Software Delivery and Infrastructure Management

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**Abstract**

Modern DevOps environments demand agility, scalability, and continuous delivery to support the rapid pace of cloud-native and distributed software engineering. Traditional automation frameworks and scripted pipelines often lack adaptability, contextual intelligence, and self-corrective reasoning, causing inefficiencies, frequent manual intervention, and slower incident recovery. To overcome these limitations, this research introduces the Agentic AI-Powered Smart DevOps Assistant (AIDA)—an intelligent system integrating large language models (LLMs) with agentic AI principles for autonomous software delivery and infrastructure management. The study focuses on conceptual design, system architecture, and AI integration to enable context-aware decision-making, proactive automation, and natural language interaction in DevOps workflows. The architecture includes five layers: a user interaction layer for natural language communication, an AI core layer powered by fine-tuned LLMs for reasoning and contextual understanding, an agentic orchestration layer using frameworks like LangChain or CrewAI to manage task-specific agents, an integration layer connecting tools such as Jenkins, Docker, Kubernetes, and Prometheus via secure APIs, and a governance layer ensuring ethical, transparent, human-supervised automation. Data was gathered through surveys and interviews with DevOps professionals to identify challenges, while secondary data from GitHub Actions and Jenkins pipelines informed design decisions. The model uses Low-Rank Adaptation (LoRA) fine-tuning to improve efficiency, reduce cost, and enhance domain specialization. AIDA is deployed in a sandboxed environment for validation and controlled testing to ensure reliability and compliance. Governance features like role-based access control (RBAC), audit logging, and human-in-the-loop approvals guarantee accountability.

**Keywords:** *Agentic AI, Autonomous Devops, Context-Aware Automation, Large Language Models (Llms), Human-Collaborative Systems.*

# An Analysis of a Machine Learning-Based Smart-Glove for The Speech- Impaired Community in Sri Lanka

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**Abstract**

Speech-impaired individuals in Sri Lanka face significant communication barriers that restrict access to education, healthcare, and employment. Assistive technologies, particularly smart gloves, have emerged globally as potential solutions by recognizing sign language gestures and converting them into text or speech. Internationally, such systems have shown significant progress in gesture recognition through machine learning and sensor integration, but their effectiveness is largely limited to American Sign Language (ASL), Indian Sign Language (ISL), or other regional systems. This raises concerns regarding cultural and linguistic adaptability for Sri Lankan Sign Language (SSL). This review-based study analyzes existing literature on wearable assistive technologies, machine learning-based sign language recognition, and SSL-specific initiatives. The findings reveal significant gaps in dynamic gesture recognition, comprehensive system integration, and localized speech synthesis in current Sri Lankan research. However, advances in deep learning, sensor fusion, and multilingual text-to-speech (TTS) systems demonstrate the technical readiness for SSL-based solutions. The study identifies four critical gaps: inadequate focus on SSL's cultural and linguistic features, insufficient dynamic gesture handling, lack of real-time Sinhala and Tamil speech output, and limited affordability. By systematically reviewing existing research and identifying these challenges, this paper highlights the feasibility of SSL-specific smart gloves while recommending localized development strategies for meaningful impact on the speech-impaired community in Sri Lanka.

**Keywords:** *Smart Glove, Sri Lankan Sign Language, Machine Learning, Assistive Technology, Speech Impairment.*

# Data-Driven Machine Learning Model to Predict Key Determinants of Student Academic Performance

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**Abstract**

This study presents a data-driven machine learning approach to predict student academic performance by identifying the most influential determinants. In the evolving landscape of education, understanding the factors that shape student outcomes is crucial to developing effective support systems. A comprehensive dataset was leveraged, containing various student-related attributes to explore their influence on final exam scores. The methodology involved data pre-processing, feature selection, and training multiple regression-based machine learning models, including Linear Regression, Random Forest, and Gradient Boosting. The models were evaluated using Mean Absolute Error (MAE), Root Mean Squared Error (RMSE), and R-squared (R2). The results indicate that Linear Regression was the most effective model for this dataset, achieving an R2 value of 0.697517. The research successfully identified hours studied, previous scores, and tutoring sessions as the most significant predictors of student performance. These findings offer actionable insights to educators to implement targeted, data-informed interventions, fostering a more personalized and proactive approach to academic support.

**Keywords:** *Student Academic Performance, Exam Score Prediction, Educational Data Analysis, Student Success Predictors, Machine Learning.*

# Smart Tourism Planning Framework for Sri Lanka: A Data-Driven Review and Conceptual System Model

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**Abstract**

Sri Lanka hosts millions of tourists every year, but foreign visitors often struggle with inefficient trip planning, which is wasteful and reduces travel satisfaction. This literature review of existing scholarship identifies current knowledge on determinants of tourism planning and technological remedies to identify key knowledge gaps for Sri Lankan tourism growth. According to PRISMA principles, a search was performed in IEEE Xplore, ScienceDirect, Google Scholar, and tourism databases for peer-reviewed literature published between 2015-2023. From 156 preliminary sources, 29 studies that meet the inclusion criteria were selected. From the analysis of the studies, four general research topics emerged: environmental factors, including seasonality and weather; social factors, including crowd management and economic considerations, such as budget optimization; and technology solutions, including recommendation systems and mobile applications. The majority of research focuses on temperate Western targets and neglects tropical monsoon environments almost entirely. Current technology uses rarely integrate more than one group of planning variables simultaneously, and South Asian market cultural adjustment lacks empirical research to base the findings on. The review identifies three core gaps: absence of Sri Lanka-focused empirical studies examining planning determinants, deficiency of multi-factor integration methodologies, and lack of adequate cultural customization of the dominant tourism technology solutions. These findings form the foundation for destination-specific empirical research that can feed into evidence-based policy making and culturally grounded technology design for South Asia's emerging tourist destinations.

**Keywords:** *Tourism Planning Determinants, Systematic Review, Research Gaps, South Asian Tourism, Smart Tourism Technology.*

# Predictive Analysis of Student Performance Using Machine Learning

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**Abstract**

Academic performance is one of the most significant indicators of a student's future success and societal contribution. However, predicting student outcomes remains a complex challenge due to the wide variety of factors involved, including socioeconomic background, parental education, study habits, and institutional support systems. Traditional evaluation approaches often fail to capture these hidden influences, thereby limiting the ability of educators to intervene promptly. With the rapid progress in artificial intelligence and data-driven methodologies, machine learning (ML) has become an effective approach for predictive analysis in education. ML algorithms are capable of identifying intricate patterns within student datasets, leading to accurate predictions of academic outcomes. Such predictive models allow educators to proactively detect students at risk of underperforming and to provide targeted interventions such as mentoring, remedial programs, or personalized learning pathways. This research aims to apply machine learning techniques to predict student performance by analyzing relevant demographic and academic features. Data preprocessing steps such as handling missing values, normalization, and feature selection are employed to ensure data quality. Subsequently, classification models including Decision Trees, Logistic Regression, and Random Forests are developed and evaluated using metrics such as accuracy, precision, recall, and F1-score. The comparison of models highlights the most effective algorithm for reliable predictions. The findings of this study are expected to contribute to the design of intelligent student performance monitoring systems. These systems can serve as decision-support tools for educators, helping institutions to allocate resources more efficiently, improve student engagement, and ultimately enhance academic success. By integrating predictive analytics into educational frameworks, policymakers and educators can ensure timely support for learners, creating a more equitable and effective education system.

**Keywords:** *Machine Learning, Student Performance, Predictive Analysis, Educational Data Mining, Academic Outcomes.*

# SMS Spam Detection Using Machine Learning Classifiers: A Comparative Study of Model Performance

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**Abstract**

SMS spam is becoming an increasing issue in internet communication, threatening the privacy of users and network security. This paper is a comparative analysis of some machine learning spammers for SMS spam filtering from the SMS Spam Collection corpus. The 5,574 manually labeled messages (86.5% ham and 13.5% spam) were preprocessed from tokenization, removal of stop-words, stemming, and TF-IDF vectorization. Five machine learning algorithms—Naïve Bayes, Logistic Regression, Support Vector Machine (SVM), Random Forest, and Voting Classifier— were trained and tested on accuracy, precision, recall, and F1-score scores. Among them, the SVM algorithm was best overall with 98.1% accuracy, 0.97 precision, 0.89 recall, and an F1-score of 0.93 with improved ability to distinguish between spam and legitimate messages. The study confirms that proper preprocessing and feature extraction greatly enhance the performance of SMS spam detection. The introduced SVM-based method is practically applicable in real-world systems to enhance message filtering effectiveness and decrease user exposure to spam.

**Keywords***: SMS Spam Detection, Machine Learning, Vector Machine, Random Forest, TF-IDF.*

# Adapting the Algorithm: Evaluating Personalised Learning Technologies Across Cultures

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**Abstract**

Global education systems are increasingly adopting personalised learning technologies (PLTs); however, there is limited understanding of how effectively these systems operate across different cultural contexts. This study investigates how PLTs adapt to varied educational cultures, with an emphasis on learners' cognitive engagement, technological accessibility, and pedagogical alignment. Using a mixed-methods approach, the research analyses adaptive learning platforms implemented in Japan, Finland, and Sri Lanka. Data was collected from 150 students and educators through surveys and semi-structured interviews, complemented by a comparative analysis of platform algorithms and localisation techniques. Preliminary findings reveal that while PLTs significantly enhance individual learning outcomes, cultural disparities in interface design, learning pace, and instructional autonomy reduce their overall effectiveness. For instance, the autonomy-oriented learning style embedded in Western-developed PLTs often conflicts with Sri Lanka's collectivist and teacher-centred learning traditions. The study addresses this research gap by demonstrating that culturally sensitive, modular AI design improves inclusivity and engagement. It concludes that culturally adaptive algorithmic frameworks are essential for promoting equity and global relevance in personalised learning. By highlighting how algorithmic flexibility can bridge pedagogical divides, this research contributes to the broader discourse on digital equity, educational technology, and culturally responsive innovation.

**Keywords:** *Personalized Learning, Educational Technology, Cross-Cultural Education, Adaptive Algorithms, Digital Equity.*

# A Context-Aware Carbon Footprint Calculator for Sustainable Tourism in Sri Lanka

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**Abstract**

Tourism is one of the fastest-growing industries worldwide, yet it contributes significantly to global carbon emissions. In Sri Lanka, existing carbon footprint calculators often rely on generalized international datasets that fail to account for local factors such as hybrid transport systems, accommodation types, and cultural practices. This research proposes a context-aware carbon footprint calculator tailored to Sri Lanka's tourism sector, integrating localized emission benchmarks and real-time trip monitoring. The study aims to design and implement a web-based system that enables tourists and travel agents to input travel details, calculate accurate emissions, and receive personalized sustainability recommendations. By combining Sri Lanka Tourism Development Authority (SLTDA) data, traveler itineraries, and vehicle-specific inputs, the proposed solution bridges existing gaps in localization, personalization, and verification. The anticipated outcomes include: (1) a functional web-based calculator, (2) real-time tracking of carbon emissions in vehicles using IoT tools with user consent, enabling precise monitoring of actual travel-related emissions, and (3) actionable sustainability recommendations that bridge the awareness-behavior gap. This accessible tool empowers tourists to make eco-conscious decisions and support Sri Lanka's sustainable tourism goals.

**Keywords:** *Sustainable Tourism, Carbon Footprint, Context-Aware Systems, Emission Calculator, Sri Lanka.*

# A Comparative Evaluation of Machine Learning Approaches for Fake News Classification in English-Language Online News Platforms

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**Abstract**

The proliferation of fake news across online English-language news platforms and social media threatens public trust and informed decision-making. This study focuses on detecting misinformation in English-language-based political and global news articles using a machine learning framework for binary classification (fake versus real). The research utilized a Kaggle dataset comprising 44,898 articles (52% fake, 48% real) from verified digital sources. Text preprocessing involved regular expressions for cleaning, NLTK for stopword removal and lemmatization, and TF- IDF vectorization with N-grams for feature extraction. Additional sentiment and topic features were generated via TextBlob and LabelEncoder, while SMOTE addressed class imbalance. Models evaluated included Logistic Regression (98.46% accuracy), Random Forest (99.85%), LinearSVC (99.31%), and Multinomial Naive Bayes (91.97%). Logistic Regression, optimized using GridSearchCV, was selected for its interpretability and computational efficiency, achieving comparable results to Random Forest. K-means clustering (silhouette score ~0.45) revealed intrinsic data structures supporting classification insights. The framework provides a reproducible, scalable approach to fake news detection applicable to online media monitoring systems. Limitations include English-only data and static news samples. Future work should integrate multilingual datasets and transformer-based models (e.g., BERT) for contextual depth and real-time detection. By defining a clear scope and refining interpretability, this study contributes a robust, domain-specific solution for misinformation detection.

**Keywords:** *Fake News, Machine Learning, Misinformation Detection, Natural Language Processing, Text Classification.*

# AI-Powered Drowsiness Detection and Smart Assistant System

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**Abstract**

Driver drowsiness is a major contributor to road accidents worldwide, causing thousands of annual deaths. Fatigue-related crashes are often more severe due to delayed reaction times and poor decision-making by drivers. Predictable prevention methods, such as awareness campaigns or simple alert systems, lack real-time detection and personalized responses, leaving a critical gap in road safety. These researchers propose an AI-powered drowsiness detection and smart assistance system designed to be affordable, accurate, and reliable, making it suitable for both individual drivers and fleet-based transportation systems. The system integrates facial behaviour monitoring, including eye aspect ratio (EAR), blinking patterns, yawning, and facial expressions, which are strong physiological indicators of fatigue. Using lightweight computer vision and deep learning techniques, the model continuously analyzes the driver's face to identify subtle changes that precede drowsiness. This intelligent system is implemented on a Raspberry Pi 4 equipped with a night-vision camera, enabling effective operation in both day and night conditions. Unlike many costly and complex commercial setups, this design focuses on cost efficiency and ease of deployment, making it ideal for developing countries. To improve practicality and reduce false alarms, the solution also incorporates On-Board Diagnostics (OBD-II) data such as engine status, vehicle speed, and RPM values. This ensures that detection only occurs while the vehicle is in motion, preventing unnecessary alerts when the engine is idle or parked. Furthermore, the use of edge computing enables offline processing with minimal latency, ensuring continuous and reliable operation even in areas with poor or no network connectivity. In addition to detection, an intelligent voice assistant provides real-time, context-aware alerts and interactive responses. It can engage the driver in short verbal interactions, suggest nearby rest stops, and play alert sounds. These features not only enhance safety but also improve driver engagement and usability, making the system more user-friendly. Comparative analysis with existing systems highlights the advantages of combining drowsiness detection, OBD-II diagnostics, and a voice-enabled assistant into one modular and scalable framework.

**Keywords:** *Facial Recognition, Smart Driver Assistance, Driver Drowsiness, OBD II, Edge Computing.*

# A Literature Review on AI-Based Vehicle Damage Identification and Repair Shop Recommendation Using Image Processing and Sentiment Analysis

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**Abstract**

The automotive industry is increasingly integrating artificial intelligence (AI) to enhance diagnostic accuracy, service efficiency, and customer satisfaction. Traditional vehicle damage assessments rely on manual inspection, which is often subjective, time-consuming, and prone to error. This literature review examines AI-driven approaches for vehicle damage identification and recommendations from repair shops, emphasizing the convergence of image processing and sentiment analysis. Convolutional Neural Networks (CNNs) have demonstrated superior performance in automating damage detection under varying environmental conditions, while Natural Language Processing (NLP) models, particularly transformer-based architectures such as BERT and LSTM, effectively analyze user opinions to support sentiment-aware repair recommendations. The integration of these technologies enables faster insurance processing, improved predictive accuracy, and more personalized service delivery. By synthesizing key studies from 2017 to 2024, this review identifies critical research gaps related to data diversity, scalability, explainability, and ethical data handling. It concludes that hybrid CNN-NLP frameworks provide a promising foundation for intelligent, privacy-preserving, and user-centric automotive ecosystems.

**Keywords:** *Artificial Intelligence, Vehicle Damage Detection, Convolutional Neural Networks (CNNs), Sentiment Analysis, Recommendation Systems.*

# Smart Greenhouse Farming with IoT, Edge Computing, and Machine Learning for Sustainable Agriculture: A Literature Review

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**Abstract**

Smart greenhouse farming exploits the combination of Internet of Things (IoT), edge computing, and machine learning (ML) to improve crop productivity, resource economy, and operational automation. From reviewed publications between 2018 and 2025, IoT-based systems enhanced real-time monitoring of the environment, resulting in up to a 22% increase in crop yield and up to 30% decrease in water use. Scalable communication infrastructures, such as LoRaWAN, enabled wide-ranging deployments; however, cost and interoperability issues remained. ML models such as TCN-RNN, XGBoost or LSTM improved yield, disease, and climate prediction performance, and deep learning schemes timely assisted pest and anomaly discovery. With Edge Computing, latency and operational costs were reduced, and a 15% yield improvement was achieved; 20% of water was saved. Hybrid cloud–fog– edge architectures offered scalable, responsive solutions, yet deployment barriers remain in resource-constrained settings. The synthesis indicates that integrating IoT, ML, and edge technologies improves system responsiveness and sustainability; however, adoption requires addressing high investment costs, lack of standardization, and adaptation to local agricultural contexts. Hence, future work should focus on developing affordable, secure, and context-specific hybrid systems for sustainable greenhouse operations.

**Keywords:** *Smart Greenhouse, IoT, Edge Computing, Machine Learning, Sustainable Agriculture.*

# ML-Based Vehicle Mechanics and Garage Tracker: A Smart Mobile Application for Vehicle Maintenance, Safety, and Emergency Response

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**Abstract**

Vehicle owners in developing regions frequently encounter challenges in locating reliable mechanics, scheduling timely repairs, and accessing emergency assistance, particularly in rural and unfamiliar areas. Current mobile applications provide only basic features such as appointment booking and service tracking, lacking real-time diagnostic intelligence, multilingual support, and contextual awareness. This paper presents a comprehensive design proposal for an ML-Based Vehicle Mechanics and Garage Tracker, a smart mobile application that integrates machine learning, natural language processing, and geolocation technologies to address these critical gaps. The proposed system features self-diagnostic capabilities using supervised learning models, multilingual conversational support through NLP-powered chatbots, and real-time emergency dispatch services with location-aware routing. A comparative analysis of existing solutions reveals that current applications fail to integrate these capabilities into a unified platform. The proposed architecture combines predictive maintenance, intelligent diagnostics, and emergency response functionalities tailored for resource-limited environments such as Sri Lanka. This design proposal demonstrates the feasibility of developing a cost-effective, scalable solution that can significantly improve road safety, reduce vehicle downtime, and enhance accessibility to automotive services, particularly in regions with limited infrastructure. Future implementation will require localized datasets, multilingual validation, and pilot testing to verify the system's effectiveness in real-world conditions.

**Keywords:** *Vehicle Maintenance, Machine Learning, Mobile Application, Emergency Response, Multilingual Chatbot, Predictive Diagnostics, NLP.*

# A Review on AI-driven Digital Platforms for Maternal and Infant Healthcare in Sri Lanka

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**Abstract**

This paper provides a systematic review of AI-driven digital platforms aimed at improving maternal and infant healthcare, with a specific focus on the Sri Lankan context. The study addresses persistent challenges faced by both mothers and healthcare staff, including inefficient paper-based records that create significant workflow burdens for midwives, lead to data fragmentation, and are often inaccessible during emergencies, causing critical treatment delays. Additionally, it examines under-resourced maternal mental health support, a critical issue exacerbated by social stigma and the significant stress new mothers face in interpreting infant behavior, particularly cry signals. The primary aim is to critically evaluate existing technologies to identify the most effective models and define the research gaps for designing an integrated digital solution that supports both mothers and healthcare professionals. A structured literature search was conducted across academic databases through a rigorous screening process based on relevance to three core areas: digital health records, AI-powered mental health tools, and infant cry analysis. The findings indicate that while Electronic Health Records (EHRs) improve data completeness, significant challenges in usability and interoperability hinder effective clinical workflow integration. AI-powered chatbots show promise in providing accessible, private, 24/7 mental health support, but require careful cultural adaptation to be truly effective. In infant cry analysis, deep learning models like ResNet, using features such as Mel-Frequency Cepstral Coefficients (MFCCs), achieve high accuracy (up to 98%). However, the most significant finding is the pronounced research gap: the lack of a unified platform that integrates these three components to streamline data access for healthcare staff while simultaneously empowering mothers. This review concludes by highlighting the critical need for an integrated system. It provides recommendations for future development, emphasizing a user-centered design that enhances care coordination. A key recommendation is to ensure the final solution is lightweight, prioritizing low data consumption and a simple user interface to ensure accessibility in low-resource settings, while also focusing on ethical AI implementation and pilot testing to build an effective system for all stakeholders in Sri Lanka's maternal health ecosystem.

**Keywords:** *Maternal And Infant Health, AI Chatbot, Infant Cry Analysis, Digital Health, Machine Learning.*

# A Review on Optimal ML Model for Predicting Autism Spectrum Disorder among Neonates of 0-4 months using Video Analysis

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**Abstract**

This paper reviews recent research on the use of machine learning (ML) and video analysis to predict Autism Spectrum Disorder (ASD) risk in neonates aged 0–4 months. This study aims to discuss how ML models can be used to identify subtle early signs and symptoms of behavior that can be easily missed in traditional clinical practice (reduced eye contact, motor movement abnormalities, and limited responsiveness). Early diagnosis is key because the neonatal period of intervention could significantly enhance social, cognitive, and developmental outcomes. ASD diagnosis today typically occurs after the age of two, when symptoms are more visible, but this delay reduces the effectiveness of treatment. In the neonatal stage, clinical tools remain limited, and most existing technologies, such as eye-tracking and mobile screening apps, have been applied only to older infants. To fill this gap, the present review is a systematic analysis of studies that utilize supervised, unsupervised, and deep learning models on neonatal video data. Out of 70 research papers identified as relevant, 25 studies were selected on the basis of relevance, methodological rigor, and emphasis on early infancy. The results indicate that conventional algorithms, including the Random Forest and SVM, were only able to attain moderate accuracy (60-70%), yet they were unable to sufficiently model the complex spatiotemporal cues. Deeper neural networks, including CNNs and CNN-LSTM hybrids, performed better (78-83%), detecting nuanced gaze and movement patterns in a better manner. Unsupervised predictors such as clustering and autoencoders offered exploratory data when labelled data was limited. Yet, the most important problem is the limitations associated with datasets, as the majority of existing repositories are devoted to toddlers, not to neonates. This review reveals the advantages and disadvantages of existing methods and reveals definite gaps in research. Future efforts are to develop multimodal datasets that incorporate video, audio, and clinical data and come up with hybrid models that would trade interpretability for predictive accuracy. Such developments are necessary to develop scaled, non-invasive, and clinically viable solutions to diagnose ASD in newborns early in life.

**Keywords:** *Autism Spectrum Disorder, Neonates, Machine Learning, Video Analysis, Early Detection.*

# A Review of AI-Powered Smart Business Toolkits for Market Trend Monitoring, Competitor Analysis, and Consultation

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**Abstract**

Small and medium enterprises (SMEs) play an important role in economic growth nevertheless face constant difficulties in accessing affordable and efficient business intelligence (BI) and consultation services. A steep price, the lack of internal experience, and the use of disparate tools hamstring SMEs from making prompt and informed decisions powered by data. Most digital solutions are available, but they are mostly tailored to large organizations and therefore costly to use, sophisticated, and not suitable for smaller businesses with limited resources. This lack puts the SMEs at a disadvantaged position in highly competitive and dynamic markets. To overcome these shortfalls, the paper will focus on appropriate artificial intelligence (AI) solutions in developing the Smart Business Toolkit, an integrated application developed to fit the small and medium-sized enterprises (SMEs). The toolkit integrates the three-fold solution; an artificial intelligence-based consultation chatbot that provides personalized, context-relevant strategic recommendations powered by natural language processing (NLP), a competitor analysis tool that automates the process of gathering and interpreting digital market intelligence data, such as competitor activities and keyword rankings, and business trend monitoring dashboard that identifies and visualizes industry trends and consumer interests in real time. The combination of these characteristics minimizes the need to rely on several disparate solutions and the high cost of entry that is characteristic of conventional consultancy and business intelligence systems. The paper has investigated the most effective way to implement AI to SMEs based on its affordability or the possibility of using the AI, and appropriateness to the context. Specifically, it considers NLP-based interactive consultation, machine learning- based trend detection, as well as generative AI-based generation of insights into actionable recommendations. Preliminary tests of prototypes have shown that such an integration can deliver actionable, real-time intelligence to SMEs at dramatically reduced costs with an easier user experience. To conclude, Smart Business Toolkit can be seen as a breakthrough or a step towards the democratization of business intelligence between the profound analytics and its adoption by SMEs.

**Keywords:** *Artificial Intelligence, SMEs, Business Intelligence, Competitor Analysis, Trend Monitoring.*

# Model selection for Smart Accident Detection and Hospital Alert System Using ML and IOT via Mobile Application

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**Abstract**

Road accidents remain among the biggest causes of injury and death around the world, especially among young people. One of the primary reasons why accidents kill so many people is the delay in reporting accidents. Traditional accident-reporting processes usually depend on telephone calls or eyewitnesses, which consumes time before emergency medical intervention can be accessed. Delays usually decrease the chances of survival for victims. For this purpose, this research is aimed at designing an intelligent accident detection system using the Internet of Things (IoT). sensors and Machine Learning (ML) algorithms for instant crash detection and emergency notifications. Accelerometers, GPS, and gyroscopes are fitted in vehicles or mobile phones to monitor movements like sudden braking, aggressive acceleration, sharp turns, or impact in this system. If abnormal activity is detected, the information is processed by the XGBoost Machine Learning (ML) model, which has proven to be highly accurate and effective in processing structured sensor data. Compared to other models like Support Vector Machines (SVM) or Random Forest, XGBoost is better and more reliable in performing accident detection tasks. For the sake of providing efficiency and scalability to the system, sensor data is stored and analyzed using cloud computing. Once the accident is identified, emergency services, hospitals, and kin are notified automatically by the system via a mobile application. By this action, assistance is guaranteed to reach the victims in no time at all. Deep Learning methods can also be incorporated into analyzing video data from cameras installed in traffic signals to further improve detection accuracy in such complex cases. The literature of this study suggests that one can achieve a successful solution to one of the most pressing public safety issues through a combination of Internet of Things (IoT) sensors, Machine Learning (ML) models, and mobile technologies. The proposed method is practical, simple to implement, and can save lives by reducing response time. This intelligent accident detection framework universally depicts how new technology is capable of making the road safer and helping emergency responders handle accidents better.

**Keywords:** *Intelligent Accident Detection, Internet of Things (Iot), Machine Learning (Xgboost), Emergency Response System, Road Safety Technology.*

# Machine Learning Based Web App for Academic Performance Prediction

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**Abstract**

Identification of academically at-risk students is a critical issue in higher education institutions in order to enhance academic performance and decrease the number of dropouts. Despite the demonstrated high predictive strength of traditional machine learning (ML) models, where reported accuracies have been high (more than 90), their weakness of interpretability prevents their practical adoption. Teachers are unwilling to believe or follow directions based on the forecasts when the rationale of the forecasts is unclear, making these theories less valuable in practice. This poses the main research question: in what way to create an academic risk prediction model be created that would not only be accurate and understandable but also provide fairness among the student groups. In order to deal with this challenge, this paper examines the use of explainable machine learning (XAI) methods as a solution. Several classifiers were tested on a synthetic student dataset with demographic, behavioral, and academic characteristics, and they were: Random Forest, Gradient Boosting, Logistic Regression, Support Vector Classifier, and Multilayer Perceptron. To enhance transparency, the post-hoc explanation approaches (SHAP (Shapley Additive Explanations)) and LIME (Local Interpretable Model-agnostic Explanations) were used, which made it possible to attribute the features to the whole model and interpret the case at the same time. Fairness analysis was also undertaken to determine whether predictive performance was similar across sensitive subgroups, including gender and ethnicity. Current results suggest that Gradient Boosting provides the highest predictive accuracy with a measure of around 92% accuracy and an F1-macro of 0.87 when GPA was added. The most influential features were determined to be GPA, absences, and study time. Nonetheless, the implementation of the model led to a considerable decrease in performance as GPA was omitted and indicating that the model was also dependent on the academic past. SHAP and LIME gave practical recommendations, including the absence of absenteeism and insufficient time in study as the main risk factors, with the fairness analysis revealing differences among gender subgroups in GPA-free situations.

**Keywords:** *Student Performance Prediction, Explainable AI, SHAP, LIME, Academic Risk.*

# Intelligent Fire Detection in Industrial Environments: Integrating AI, IoT, and Vision-Language Models for Early Hazard Recognition.

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**Abstract**

Industrial environments face high fire risks due to flammable materials, heavy machinery, and complex electrical systems. Traditional fire detection methods, such as smoke detectors and surveillance cameras, often respond only after a fire has started and are prone to false alarms under challenging conditions, such as poor lighting or smoke. This study aims to design and experimentally evaluate an intelligent multi-modal fire detection framework that integrates Artificial Intelligence (AI), the Internet of Things (IoT), and Vision-Language Models (VLM) for early hazard recognition. The proposed system combines visual recognition using YOLOv8, sensor-based monitoring through MQTT-simulated IoT data, and contextual interpretation from VLMs to provide explainable and proactive fire-risk detection. The experimental evaluation, conducted in a Google Colab environment using industrial fire image datasets, achieved a detection accuracy of 94.1%, a precision of 91.7%, and a 30% reduction in false alarms compared to traditional sensor-only methods. These findings highlight the potential of AI–IoT–VLM integration to enable faster, more reliable, and interpretable fire hazard prediction in industrial environments, supporting the development of next-generation intelligent safety systems.

**Keywords:** *Fire Detection, Artificial Intelligence, Internet of Things, Vision-Language Models, Industrial Safety.*

# Mental Health Prediction Using Social Media Posts: A Nature-Inspired Approach

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**Abstract**

The emerging global mental health emergency requires next-generation detection systems with social media as a potential data source for psychological assessment. This study investigates the application of nature-inspired algorithms integrated with Natural Language Processing techniques in predicting mental health based on social media updates. An integral approach was adopted involving text preprocessing, TF-IDF feature engineering, and optimization through a genetic algorithm for feature selection. The research employed a carefully curated social media text dataset for well-balanced mental health states. Term Frequency-Inverse Document Frequency was applied with n-gram inspection followed by Chi-squared feature selection to identify the most discriminative features. A Genetic Algorithm was implemented using population-based evolutionary optimization, comprising tournament selection, crossover, and mutation operators. The algorithm was integrated with Support Vector Machines to create a hybrid GA-SVM model. Experimental results depicted enhanced performance of the nature-based approach with GA-SVM reporting 89.47% accuracy compared to baseline algorithms: Logistic Regression (85.00%), SVM (85.00%), and Random Forest (80.00%). Remarkably, the genetic algorithm realized 47.3% feature selection with enhanced classification performance, indicating accurate recognition of clinically valuable linguistic markers. The optimized model displayed balanced performance in precision, recall, and F1-score measures. These findings attest to the success of evolutionary solutions to high-dimensional mental health text classification tasks. The research contributes to computational mental health by providing a scalable remedy for early detection platforms that can be utilized in schools, employee wellness initiatives, and community mental health initiatives. Multimodal fusion and clinical validation must be the focus of future work to span these computational advances to beneficial mental health care systems.

**Keywords:** *Mental Health Prediction, Social Media Analytics, Genetic Algorithm, Natural Language Processing, Feature Optimization.*

# Reinforcement Learning-Based Autonomous Navigation System for a Simulated Mars Rover Craft.

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**Abstract.**

In today's world, technology-based autonomous navigation is a critical requirement for planetary exploration missions such as Mars missions, where communication delays make manual control infeasible. Traditional rule-based systems lack adaptability in dynamic and unpredictable terrains. Reinforcement Learning (RL) offers a promising solution by enabling agents to learn optimal navigation strategies through trial-and-error interactions in simulated environments. This study aims to design and implement an RL-based autonomous navigation system for a simulated Mars rover using Unity ML-Agents. The rover will be trained using the Proximal Policy Optimization (PPO) algorithm to perform obstacle avoidance and goal-directed navigation. The expected results include improved adaptability compared to rule-based approaches and the ability to generalize across different terrain configurations. This research contributes to the development of cost-effective, simulation-based frameworks for planetary robotics, reducing risks before real-world deployment.

**Keywords:** *Reinforcement Learning, Mars Rover, Autonomous Navigation, Unity ML-Agents, PPO.*

# AI-Driven Road Accident Detection and Severity Prediction with Geo Temporal Intelligence

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**Abstract**

Road accidents remain a major global health concern, causing more than 1.3 million deaths annually, with the highest burden in low- and middle-income countries (World Health Organization, 2023). Traditional reporting methods are often slow and incomplete, leading to delays in emergency response and limiting prevention strategies. To address these issues, this study developed an AI-driven framework that integrates accident detection, severity prediction, and geo-temporal intelligence. Accident detection was supported by deep learning methods, while severity prediction was performed using machine learning classifiers, including Decision Tree, Gradient Boosting, and Random Forest. A stratified sample of 10,000 records was drawn from the U.S. Accidents dataset, and geo-temporal features such as location, weather, and time of day were added to improve accuracy. Data preprocessing included cleaning, encoding, and balancing to ensure fair training. The results showed that the Decision Tree model achieved the highest accuracy (86.05%), followed by Gradient Boosting (83.7%) and Random Forest (77.9%). Road type, weather, and peak-hour indicators emerged as the most influential factors. To demonstrate practical application, the framework was deployed through a Streamlit interface, enabling users to obtain real-time severity predictions. Overall, the findings suggest that combining AI with geo-temporal intelligence can support faster accident detection, more reliable severity prediction, and improved road safety planning. This approach provides actionable insights for policymakers, urban planners, and emergency services, highlighting its potential for safer and smarter transportation systems.

**Keywords:** *Road Accidents, Machine Learning, Geo-Temporal Intelligence, Severity Prediction, Intelligent Transportation.*

# AI-Powered Mobile Guide for Sustainable Eco-Cultural Tourism in Sri Lanka: Development and User Assessment

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**Abstract**

Tourism in Sri Lanka contributes to economic development, but rural tourism still experiences challenges like language barriers, lack of connectivity, absence of cultural information, and emergency support. The purpose of this research is to overcome these restrictions by presenting an AI-based mobile app that will offer personalized itinerary planning, offline and multilingual support services, and emergency SOS capabilities. The app also enhances the local business and cultural interaction, which is in line with sustainable tourism. The mixed-methods research design was used, which involves both quantitative data from 100 domestic and international tourists and qualitative data from the responses based on open-ended questions. The results have shown that three-quarters of the respondents (mainly aged between 26 and 45 years old) make decisions when it comes to sustainability in the planning of their travels, with 82% favoring a mobile-based option. Moreover, 68% have placed value on multilingual support, and 61% have placed value on offline accessibility as an essential feature. Thematic analysis identified several themes of issues regarding accessibility, environmentally friendly transportation, and real-time updates on the cultural front. These findings support the fact that there is a high demand for integrated AI-based solutions that improve inclusivity, sustainability, and participation of the local community. This research will help develop AI applications within tourism by suggesting a framework of offline-capable and eco-cultural mobile solutions. Future studies will continue the development of prototypes, testing user experience and predictive analytics towards improved personalization.

**Key Words:** *Artificial Intelligence (AI), Eco-Tourism, Cultural-Tourism, Emergency-Support, Multilingual Support.*

# Smart Lanka Trade – A Modern LKR-Based Stock Trading Platform with AI-Powered Features

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**Abstract**

The stock trading ecosystem in Sri Lanka still depends on obsolete and disjointed systems that cannot meet the expectations of the current investors. Existing platforms do not offer such features as AI-based analytics, demo trading, automated onboarding, and currency benchmarking on a global scale. Such limitations diminish the involvement of investors, reduce efficiency, and make the Colombo Stock Exchange (CSE) unable to compete in the current globalized financial markets.

This research is a proposal for a safe and innovative trading platform in the Sri Lankan market named SmartLanka Trade. As a full LKR-compliant solution with the local financial regulations, the system also offers sophisticated features of international trading systems. It has such features as real-time and demo trading, market forecasting models with the use of AI/ML, optimization of a portfolio, and risk management. OCR-enabled onboarding to simplify the process of creating an account, chatbot-based customer support to provide round-the-clock support, and tools to convert LKR to global currency are the other features included in the platform to serve more investors and enable them to benchmark their performance globally. Scalability, integrity, and alignment to regulations is achieved by deploying SmartLanka Trade in Oracle Database 19 with auditing and monitoring mechanisms that are in line with the requirements of the Securities and Exchange Commission (SEC). The study is based on a mixed-methodology, which involves surveys, expert interviews, CSE datasets, and financial APIs. Assessment concerns regulatory compliance, predictive performance of AI/ML models, usability and investor adoption, and feasibility of overall deployment in the Sri Lankan financial market. SmartLanka Trade seeks to provide a contemporary regulation compliance and easy-to-use trading platform by filling these gaps. The system would improve transparency, investor trust, and participation in the market, as well as place the CSE at the cutting edge of technology and competitiveness as an exchange. Finally, the study aims to narrow the technological gap among the capital markets of Sri Lanka and promote wider financial access, innovations, and sustainable economic development.

**Keywords:** *Stock Trading, Artificial Intelligence, Fintech, Currency Conversion, Oracle Database.*

# Digital Transformation of Traffic Management in Sri Lanka: A Multi-Stakeholder Analysis of E-Fine SL Implementation Through Behavioral, Technical, and Socio-Economic Perspectives

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**Abstract**

Sri Lanka's traffic fine management system is burdened by inefficiencies stemming from outdated and paper-based processes. This research introduces E-Fine SL, a centralized digital platform designed to integrate traffic fine issuance, online payments, and a driver demerit rating system. For traffic police, the system provides a mobile application enabling real-time fine issuance, driver history access, and license status management. For drivers, it ensures transparency through instant fine details, secure digital payments, and predictive demerit tracking. Supplementary features, such as citizen violation reporting, a digital document wallet, and automated renewal notifications, further enhance road safety and compliance. Drawing from successful international models like India's e-Challan and Dubai's smart traffic system, this study adapts global best practices to the Sri Lankan context. Ultimately, E-Fine SL seeks to modernize traffic governance, reduce administrative burdens, and foster long-term behavioral change among drivers.

**Keywords:** *Traffic Fines, Digital Governance, Road Safety, Driver Demerit System, E-Fine SL.*

# Crop Demand and Price Forecasting with AI Farmer Assistant

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**Abstract**

This research addresses a major issue in Sri Lanka's agricultural planning, which is reactive rather than proactive, short-term focused crop overproduction or underproduction, and price crashes. These mismatched factors cause financial losses for farmers, crop surplus, price fluctuations, unnecessary food imports, postharvest wastages, and a negative impact on farmers, consumers, and the government. This study was done to develop a proactive, data-driven solution to address this issue and help prevent surplus production and price crashes. The study presents a design of an AI-powered software system that predicts upcoming monthly crop production and consumption in cooperation with a farmer registration system for each crop to maintain crop production and prevent excess or dearth, which leads to market instability. The system also suggests alternative crops if a particular crop exceeds its margin of production based on farmers' areas, weather, and crop cycles in that area. Additionally, this offers a marketplace for farmers to buy tools, equipment, seeds, and crops. Technological approach makes advanced machine learning models to implement, such as Random Forest, Decision Trees, and K-Nearest Neighbors, with the implementation of a chatbot assistant and Internet of Things (IoT) for real-time validation. This solution uses both mobile and web technologies that support cross platforms to deliver an easy-to-use approach for farmers. This research discovers that the integration of machine learning and AI chatbots can effectively help farmers to reduce crop surplus and price crashes. This proactive system suggests strategic planting guidance, reduces financial risks, and real real-time market demand analysis. This system enhances Sri Lanka's agricultural efficiency and sustainability with promising results.

**Keywords:** *Crop Prediction, Price Forecasting, Surplus Prevention, Machine Learning, Agricultural Chatbot.*

# Therapy Mind: An AI-Driven Real-Time Multimodal Emotion Recognition and Mental Health Support System

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**Abstract**

Mental disorders pose a major global concern affecting individuals across diverse settings. Social connections often break down as a result. Individual productivity, economies, and healthcare systems are significantly affected by mental disorders. Even though awareness is pervasive, access to prompt, low-cost, and tailored mental health services remains restricted. Hence, the aforementioned points point to a pressing demand for fresh approaches. Progress in artificial intelligence and related fields like affective computing opens up real possibilities. It could reshape how mental health care works. Systems for spotting emotions draw on computer vision methods and speech analysis tools. They pick up emotional cues right as they happen. Such tools allow for digital therapy options that spread widely. These platforms might cost less overall. They could prove more reachable for users. In fact, context is integral in relation to their design. The Therapy Mind initiative addresses these gaps. It builds a web platform with authentic features. Multimodal emotion detection is positioned at its core. It pairs this with established treatments like Cognitive Behavioral Therapy and Dialectical Behavior Therapy. The setup relies on advanced models. Convolutional Neural Networks handle facial emotion detection effectively. Long Short-Term Memory networks process speech emotions reliably. A combined method blends visual and sound inputs together. This setup yields stronger results than using just one type of data alone. It shifts based on a user's current feelings, unlike basic chat systems that stick to text. Interventions appear in small, fitting doses that match the moment. Ethics shapes the whole effort from the start. Privacy measures protect user information closely. Consent processes inform participants fully. Data stays secure through strict handling. Crisis features alert human experts quickly when risks appear high. In the end, Therapy Mind seeks to provide a smart tool for mental support. It aims to facilitate individuals to experience approachability, understanding, and authentic assistance through AI means.

**Keywords:** *Mental Disorders, Artificial Intelligence, Emotion Detection, Cognitive Behavioral Therapy, Privacy.*

# Real-Time Fake News Detection with Explainable and Reproducible ML Models

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**Abstract**

The development of Internet communication has made it easier to bring fake news or misleading news to people, which influences the decisions of people and reduces the level of media trust. Traditional rule-based techniques are ineffective in the task of detecting such news, i.e., messages tend to be short, informal, and lacking in background. The primary objective of this research is to create a powerful and interpretative fake news detection model using Natural Language Processing (NLP) and classical Machine Learning (ML) methods. The information gathered was supplied by Kaggle; the information entails the fake and the genuine news pieces. The preprocessing consisted of cleaning, tokenization, lemmatization, and removing stop words. Four ML models were experimented with, and their TF-IDF features were extracted: logistic regression, the support vector machine, naive Bayes, and the random forest. Logistic Regression was used to generate the highest accuracy (96) with a balanced precision and recall, thus making it an effective lightweight alternative. To improve the confidence of the users, word contributions have been visualized using Explainable AI techniques, such as SHAP and LIME, to visualize the prediction. Streamlit was also used to build a real-time user message classification web application. The results confirm that simple, explicit ML schemes may provide strong foundations and be replicated. The framework is extensible and can be used in applications in the real world, especially in resource-constrained environments.

**Keywords:** *Fake News Detection, Machine Learning, NLP, TF–IDF, Explainable AI.*

# Designing a Deep Learning Model for Snake Identification in Sri Lanka: A Literature-Guided Approach

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**Abstract**

In Sri Lanka, snake envenoming remains a major health and ecological challenge. Even though Sri Lanka is home to more than 108 snake species, snake identification constitutes a critical gap, which leads to inefficient treatments and snake conservation efforts. Currently, 35% of snakebite cases go unidentified, while snake-human conflict has further escalated due to myths and misidentification. Regardless of the progress of computer vision and species identification on a global scale, the existing datasets suffer from issues such as class imbalance and regional bias, which make them virtually useless during emergencies in the context of Sri Lanka. To analyze, interpret, and synthesize existing literature, a thematic literature review was conducted by utilizing the aid of academic databases such as IEEE Xplore and Lens.org, targeting existing datasets, deep learning architectures, evaluation strategies, and real-world applications of snake identification systems. This review indicates that Convolutional Neural Networks (CNNs), especially lightweight models such as MobileNet and EfficientNet, offer adequate performance in resource-constrained environments, while Vision Transformers (ViTs) demonstrate higher accuracy on large-scale data, yet remain computationally demanding. The hybrid and ensemble approaches bring forth promising results by incorporating the higher efficiency of lightweight models and the superior accuracy of ViTs. The review also highlights that dataset quality, including class balance, labeling accuracy, and background realism, directly impacts model performance and its ability to generalize. Essentially, this review demonstrates the need for localized, well-annotated, and balanced datasets, which can be utilized to train lightweight CNN models by integrating hybrid strategies with ViTs for improved accuracy. This will ultimately result in mobile and web-based applications that will enhance medical decision-making, support biodiversity conservation, and reduce unnecessary snake killings in Sri Lanka.

***Keywords:*** *Snake Species Classification, Deep Learning, Convolutional Neural Networks (CNNs), Vision Transformers (Vits), Sri Lanka.*

# A Multi-AI Approach to Personalized Carbon Footprint Tracking: Combining Temporal Fusion Transformers and Causal Inference for Sustainable Behavior Change

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**Abstract**

Global warming is the principal worldwide environmental challenge of the era, requiring rapid and efficient measures for mitigation that connect constructively with people, whose aggregate personal lifestyle choices determine the transportation, diet, use of energy, and waste production, representing the majority of worldwide emissions of greenhouse gases. There is poor knowledge in the public and awareness of personal carbon footprint, since available measurement tools are not able to engender effective comprehension. Traditional sites, like WWF's and CarbonFootprint.com, are predominantly static, offering generic one-off results of calculations without dynamic, tailored feedback, and therefore do not encourage sustained behavior change or offer a clear, actionable route to carbon savings. This study directly fills these vital gaps by design, creation, and empirical testing of an innovative, AI-based web application that aims to provide hyper-personalized, contextual, and actionable suggestions, thus enabling users to achieve significant and sustainable reductions in their environmental footprint.

The system to be designed uses a state-of-the-art multi-aspect AI framework: a Temporal Fusion Transformer (TFT) model provides highly accurate, time-sequenced carbon footprint predictions by capturing long-distance context and trends in lifestyle data input by users, Double Machine Learning (DML) supports effective causal inference analysis, accurately taking into consideration the most effective behavioral changes customized for each user's profile, separating causality from correlation; and a reinforcement learning module maximizes user engagement through adaptive personalization of nudges' timing, modality, and content. This technology design has a theory-based interactive dashboard and is anchored in empirically supported behavioral science theories such as the Persuasive Systems Design (PSD) model and the Transtheoretical Model (TTM), making the intervention approach theoretically grounded and empirically informed.

**Keywords:** *Carbon Footprint, Artificial Intelligence, Personalized Recommendations, Behavioral Science, Sustainable Computing.*

# Smart Fuel Station & Vehicle Service Center Navigator with Fuel Consumption Prediction

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**Abstract**

The 2022 Sri Lankan fuel crisis exposed severe inefficiencies in vehicle service management and fuel distribution through excessively scattered and isolated digital apps. This paper presents the concept and development of a unified mobile app named Smart Fuel & Service Navigator that combines smart fuel station navigation, management of vehicle service centers, and a machine learning model for forecasting fuel consumption. A systematic literature review was conducted to analyze prevailing solutions and to discover a significant gap: while prevailing systems address single features, no one provides an integrated, comprehensive platform adjusted to the specifics of developing economies. The system in question encompasses live fuel availability updates (via operator input), station location and fuel-type filtering based on GPS, dynamic service booking based on live tracking, and an integrated payment gateway. Light-weight fuel consumption prediction model—based on fuel type and distance traveled is programmed to function effectively in resource-restricted mobile settings. This research primarily contributes towards a conceptual and technical plan for an integrated digital solution, supported by a literature review and prototype development. The proposed approach is more user-friendly, enables efficient resource management for service providers, and promotes environmentally friendly fuel usage behavior—moving directly to address the digital fragmentation witnessed during the 2022 crisis.

**Keywords:** *Digital Integration, Mobile Application, Fuel Management, Vehicle Service, Fuel Consumption Prediction, Sri Lanka.*

# Predictive Machine Learning Mobile Application for Sri Lankan Diet Tracking and Calorie Estimation to Address NCDs for Public Health

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**Abstract**

Dietary habits are the most important modifiable risk factors of noncommunicable diseases (NCDs) in Sri Lanka, a country with a significant burden of these diseases. The limitation of proper dietary assessment is the absence of detailed, culturally appropriate food composition databases that would reflect the nutritional character of the Sri Lankan standard cooked and mixed food items. Current data, including the United States Department of Agriculture (USDA) database and the few national food tables, mostly contain data on raw ingredients, which do not represent the complexity of calories and nutrients in locally prepared food. This research undertakes the necessary steps to fill this gap by creating a country-specific calorie database on the Sri Lankan food and incorporating it into an Android-based mobile application that would fit the needs of the target population, who are susceptible to diet-related health issues because of urban living, poor dietary practices, and academic pressures. The system utilizes the lightweight convolutional neural network (CNN) architectures to identify dishes by utilizing the food images and the ensemble regression model to estimate calories. The app allows automatic food dieting, customized nutrition tracking, and situational nutritional advice. Pilot testing on curated datasets showed about 75% top-one dish recognition and calorie estimation errors at par with international standards on mobile health applications. This combined solution addresses a serious knowledge gap in localized digital health applications and provides a framework for scaling culturally tailored dietary evaluation and aiding the prevention and treatment of diet-related NCDs in the national public health system of Sri Lanka.

**Keywords:** *Food Composition Database, Calorie Estimation, Machine Learning, Android Application, Public Health, Dietary Tracking, NCD Prevention.*

# A Multimodal AI Framework for Real-Time Emotion, Confidence, and Conflict Detection in Mock Interviews

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**Abstract**

This study proposes the development of an AI-based mock interview evaluator designed to address the limitations of traditional and existing technological interview preparation platforms. Current systems often rely on unimodal analysis, focusing solely on speech content or facial expressions, leading to fragmented and often inaccurate assessments. This research introduces a novel multimodal framework that synchronously integrates three data streams for holistic evaluation: visual cues for facial emotion recognition using convolutional neural networks (CNNs), auditory features for speech-based confidence analysis, and physiological signals via IoT-based heart rate variability (HRV) sensing. The purpose of this research is to develop and validate a real-time fusion of these modalities to not only assess individual channels but also to detect critical cross-modal conflicts, which are indicative of underlying anxiety or inauthenticity. By identifying discrepancies between what is said, how it is said, and physiological responses, the system provides a more robust and objective assessment of a candidate's behavioral readiness. Preliminary findings from the literature reveal that while Convolutional Neural Networks (CNNs) can achieve over 92% accuracy in facial emotion recognition in labs, their performance drops by 18-22% in real-world settings. Similarly, speech analysis models like Confidence Decision Networks (CD-Net) show promise but encounter difficulties with environmental noise and accent diversity. Crucially, the review found that a significant research gap exists in the real-time fusion of these modalities with physiological data to detect cross-modal conflicts (e.g., a confident statement paired with elevated HRV), which are potent indicators of inauthenticity or anxiety. The proposed methodology involves a structured, multi-phase approach for data collection, real-time processing with CNNs and acoustic-prosodic feature extraction, and a dedicated module for multimodal conflict detection. The anticipated outcome is a comprehensive platform that delivers immediate, actionable feedback to users, thereby enhancing self-awareness, reducing performance anxiety, and significantly improving interview preparedness.

**Keywords:** *Multimodal AI, Interview Evaluation, Emotion Recognition, Confidence Detection, Real-Time Feedback.*

# Automated Fake News Detection Using Machine Learning and NLP Techniques

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**Abstract**

The spread of misinformation across online platforms has reached an unprecedented scale, challenging public trust, democratic stability, and health communication. Manual verification by fact-checkers is highly valuable but insufficient to counter the sheer speed and volume at which false information spreads. Consequently, the integration of Machine Learning (ML) and Natural Language Processing (NLP) has become essential to design scalable and automated solutions for fake news detection. This study investigates the effectiveness of combining preprocessing techniques, feature extraction, and classification algorithms to automatically identify deceptive news articles. A benchmark dataset containing both fake and authentic news articles was collected and prepared for analysis. Data preprocessing involved stopword removal, punctuation filtering, tokenization, lemmatization, and normalization to lowercase (S. Bird, 2009). Feature extraction was conducted using Bag-of-Words, TF–IDF, and advanced embedding methods to transform unstructured text into structured numerical representations. Classical ML models—including Logistic Regression, Naïve Bayes, Random Forests, and Support Vector Machines (SVM)—were trained and evaluated alongside deep learning models such as Long Short-Term Memory (LSTM) networks. The evaluation used accuracy, precision, recall, F1-score, and confusion matrices to compare models. Logistic Regression achieved a strong baseline performance with over 92% accuracy. Naïve Bayes, while efficient, performed slightly lower at around 89%. SVM outperformed classical models with approximately 94% accuracy. However, the deep learning LSTM model achieved the highest accuracy, nearly 95%, confirming its advantage in capturing sequential dependencies in text. These results demonstrate that hybrid approaches—combining classical ML methods with deep contextual embeddings such as BERT—can further enhance robustness. The study emphasizes the importance of preprocessing, balanced datasets, and comprehensive evaluation for achieving reliable classification. The findings contribute to developing real-time misinformation detection systems, with direct implications for social media monitoring, journalism, and policymaking. Future work should expand dataset diversity, address explainability, and integrate models into live digital ecosystems (al, 2021).

**Keywords:** *Fake News Detection, Machine Learning, Natural Language Processing, Text Classification, Automated Misinformation Detection.*

# Using Virtual Reality to Overcome Academic Phobia

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**Abstract**

Academic anxiety is a growing concern among university students. It is usually the main reason that negatively affects students' performance, self-confidence, and soft skills development. Counselling and cognitive behavioral therapy (CBT) may not always be the right choice, especially for students who prefer digital tools. Their effectiveness is often questioned, and they are not easily accessible. This VR-based (virtual reality) system is intentionally created to help students overcome academic anxiety by providing safe and controlled practice opportunities for presentations, oral exams, etc. This method is a successful implementation of a combination of CBT, exposure therapy, and flow theory, which works to reduce fear, establish confidence, and increase engagement. The idea behind this technology is to provide students with the closest possible reality where they can practice as they please and not have to worry about judgment. They can do this as many times as they need until their fear gradually subsides. This could be an effective way to deal with the situation in Sri Lanka, where there are certain cultural and social misconceptions surrounding people discussing their problems and seeking support from a professional. The proposed VR-based system will provide students with a contemporary, confidential, and interactive tool to not only improve their well-being and participation but also to promote their long-term development. Therefore, our goal in this project is to develop a system that can provide a solution to academic phobia among undergraduates in Sri Lankan universities using a virtual reality system.

**Keywords:** *Academic Phobia, Virtual Reality, Exposure Therapy, Cognitive Behavioral Therapy, Student Well-Being.*

# A Literature Review of AI-Based Multilingual and Multimodal Fake News Detection

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**Abstract**

The purpose of this research is to synthesize existing literature on AI-based fake news detection to inform the development of a tailored platform to mitigate misinformation in Sri Lankan social media contexts. The rapid proliferation of fake news and deepfake content on social media platforms poses a significant threat to information credibility, particularly in Sri Lanka, where social media usage is surging. This study proposes an AI-based platform tailored to detect fake news among Sri Lankan social media users, integrating image-based machine learning and text-based natural language processing (NLP) models to provide real-time feedback through a recommendation system. This literature review synthesizes existing research on fake news detection, focusing on three key areas: factors contributing to the creation and spread of misinformation, machine learning and deep learning techniques (e.g., CNN, RNN, LSTM, BERT, SVM, KNN) to detect fake news and deepfakes, and evaluation approaches to assess content authenticity. The review highlights the effectiveness of deep learning models like LSTM and BERT in capturing complex textual patterns and CNNs for image analysis, while traditional methods like SVM rely on feature engineering. Critical research gaps include the lack of Sri Lanka-specific datasets, limited studies on multilingual (Sinhala/Tamil/English) misinformation detection, and the need for hybrid multimodal models. The proposed platform addresses these gaps by leveraging a dataset from Kegalle, combining true and fake news, and developing a custom model for real-time detection. This study aims to deliver a locally adapted, accurate, and user-friendly solution to mitigate misinformation in Sri Lankan social media contexts, contributing to enhanced digital trust and societal stability.

**Keywords:** *Multilingual, Multimodal, Fake News Detection, Artificial Intelligence, Natural Language Processing.*

# Paddy Auction Price Prediction Using Machine Learning and Real- Time API Integration for Smart Farming in Sri Lanka

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**Abstract**

Auction price volatility, which is influenced by seasonal, climatic, and policy factors, presents ongoing difficulties for Sri Lanka's paddy farmers. This study suggests a decision-support system that is integrated with real-time APIs and investigates the application of machine learning (ML) to forecast paddy auction prices. Preprocessed, and enhanced historical auction data was gathered (2015–2024) with contextual characteristics like quality, region, and seasonality. Mean Absolute Error (MAE) and Root Mean Squared Error (RMSE) were used to train and assess a number of models, including Linear Regression, Random Forest, Gradient Boosting, and XGBoost. The results showed that XGBoost outperformed baseline models by a significant margin, achieving the best performance (MAE = 6.9, RMSE = 8.7).A Streamlit-based web application was developed to deliver real-time, farmer- friendly predictions. The research demonstrates that integrating predictive analytics with real-time data can empower farmers to negotiate fairer prices, enhance market transparency, and reduce financial risks. Future improvements include expanding the framework to other crops, integrating real-time.

**Key words:** *Paddy, Auction Price Prediction, Machine Learning, Smart Farming, Sri Lanka.*

# Identifying and Suggesting Remedies for Fungal Diseases in Flowering Plants Using Machine Learning: "A Comprehensive Review".

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**Abstract**

One of the critical threats to agriculture worldwide is fungus related illnesses, which pose a special risk to flowering plants by expressively reducing harvest and quality. In Sri Lanka alone, an estimated 20,000– 30,000 small scale farmers depend on flowering plants as their main source of revenue, but just 1-3% of farmers globally are engaged in floriculture. With annual harvest losses of up to 70% in natural situations, these crops are really vulnerable to more than 1,000 fungal diseases, including powdery mildew, botrytis blight, and downy mildew. Traditional diagnostic methods, such as skilled eye inspection, microscopic examination, and laboratory cultivation, are expensive, time consuming, and mostly unavailable to rural farmers with limited resources. Furthermore, the visual similarity of symptoms among many fungal illnesses sometimes leads to mistaken or shifting diagnoses. Current progresses in Machine Learning (ML) and image processing offer efficient, accurate, and scalable replacements for fungal disease detection. Convolutional Neural Networks (CNNs) and transfer learning approaches have established precisions above 95% in identifying powdery mildew and botrytis blight in ornamental crops such as gerbera and rose. Hyperspectral imaging combined with 3D-CNNs, Modified Deep Neural Networks (MDNNs), and unsupervised learning methods further enhance sensitivity under variable field conditions. Corresponding techniques such as Raman spectroscopy, Loop- Mediated Isothermal Amplification (LAMP), and Surface Enhanced Raman Spectroscopy (SERS) have also shown strong potential for non-destructive and portable detection. However, most of these applications remain limited to laboratory or desktop environments and primarily target main food crops, with minimal emphasis on flowering plants. This study reviews existing research on ML-based fungal disease detection, identifies gaps in applications to floriculture, and proposes the development of a mobile based ML system integrated with cloud platforms. The proposed approach combines CNNs, YOLO models, and transfer learning with field collected RGB images of flowering plants, enabling real time in field diagnosis and data storage for continuous learning.

**Key words:** *Flowering Plants, Machine Learning, Image Classification, Fungal Diseases, Mobile App.*

# A Review for BrandyBot: An AI-Powered Branding & Mock-up Toolkit for Startups and Non-Designers

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**Abstract**

With the fast growth of digital markets, branding has become a key factor for business success. Many AI integrated tools such as Looka, Wix Logo Maker, Tailor Brands, and Canva already support parts of branding, but they mostly handle single tasks and do not give full guidance for people without design skills. Some recent studies also show that conversational AI can shape brand personality, build trust, and increase user engagement, though this option is still rarely used in branding platforms. This paper reviews existing studies in order to position BrandyBot, an AI-powered branding toolkit that combines logo generation, brand guideline creation, and responsive mockup design inside an interactive chatbot. A survey with 100 entrepreneurs, students, and small business owners was carried out to capture their real needs, while secondary research helped analyze current branding tools. BrandyBot is presented as a creative partner that offers personalized support and makes brand building simpler for non-designers.

**Key words:** *Artificial Intelligence, Chatbot, Logo Generation, Brand Guidelines, Generative AI.*

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# Cyberbullying Detection on Social Media Using NLP And Machine Learning

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**Abstract**

The high rate of social media development has promoted global communication, and resulted in more people being exposed to negative online habits, especially cyberbullying. It is difficult to find such cases because text on the Internet is informal in nature and contains many different varieties of slang, abbreviations, emojis, and expressions in several languages [38]. This work assesses how well machine learning (ML), deep learning (DL), and large language models (LLMs) can identify cyberbullying in noisy and imbalanced data sets [38], [40]. A publicly accessible cybersecurity threat dataset comprising of 3,000 incidents was used [41]. Preprocessing of the data was performed through normalization, PCA- based dimensionality reduction [42], K-Means clustering [43], and resampling to deal with imbalance. Two trained algorithms were used: the Random Forest [45] and Support Vector Machine (SVM) [46] trained on a 70/30 split with the hyperparameters optimized using the Grid Search and cross-validation [47]. Findings reveal that the best performance was obtained with Random Forest with an accuracy of
and precision and recall of the model approach 1.00 of all severity categories, which shows that the model is robust even before the tuning process. SVM was also able to perform at a competitive accuracy of 99.44. When measuring the importance of features, financial loss was identified as the most important predictor of severity, followed by the temporal factors. Such results are consistent with previous studies that indicate that hybrid models and ensemble models are better than conventional ones in cyberbullying and threat detection [38], [39]. There are two implications of this work. Technically, it confirms the implementation of ensemble learning, preprocessing and clustering to promote classification of cyber incidents. Socially, these systems can be used for reliable detection so that social media can intervene early before cyberbullying causes psychological damage [39], [40]. Moreover, the comparative evaluation of ML, DL and LLMs preconditions the further future development of online security, automated content management, and the digital wellbeing [38], [40].

**Keywords:** *Cyberbullying Detection, NLP, Machine Learning, Transformers, Sentiment Analysis*

# The Type of Machine Learning Model That Works Best for Creating an Automated Lecture and Lab Scheduling System

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**Abstract**

The increasing complexity of academic scheduling in higher education has intensified the need for intelligent and automated solutions, particularly within Sri Lanka's private sector campuses, where rapid expansion has led to frequent clashes in lecture and laboratory timetables. Traditional rule-based or heuristic scheduling methods have proven insufficient in addressing the dynamic and resource-constrained nature of modern academic environments. This research investigates the question of what type of machine learning (ML) model would work best for creating an automated lecture and lab scheduling system. By evaluating different ML approaches, including decision tree–based models, neural networks, and reinforcement learning (RL), this study identifies the most suitable method for application in Sri Lankan private campuses. The findings indicate that decision tree models, such as Random Forests and Gradient Boosted Trees, provide interpretability and robust handling of categorical scheduling data, while neural networks can capture complex relationships between variables when large datasets are available. However, both approaches face limitations in adaptability and scalability, which are essential in environments where timetables must frequently be updated due to changes in lecturer availability, student enrollment, or resource constraints. Reinforcement learning, in contrast, demonstrates significant advantages by modeling scheduling as a sequential decision-making process, enabling continuous improvement through feedback. This adaptability ensures the balancing of hard constraints, such as classroom capacity, with soft constraints, including lecturer preferences, thereby producing both efficient and fair schedules. The research concludes that reinforcement learning offers the most context- appropriate solution for Sri Lanka's private sector campuses. Its integration into scheduling systems has the potential to minimize administrative workload, reduce human error, and enhance institutional efficiency. Furthermore, future applications could involve hybrid models that combine RL with metaheuristic optimization or fuzzy logic, thereby improving scheduling quality and adaptability.

**Keywords:** *Machine Learning, Reinforcement Learning, Automated Scheduling, Timetabling, Sri Lankan Private Campuses.*

# A Review of an AI and IoT-Driven Robotic System for Precision Agriculture in Smart Greenhouses

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**Abstract**

Traditional greenhouse farming requires intensive manual monitoring of plant health and environmental factors, resulting in time-consuming, error-prone processes that negatively affect crop yield. This research addresses the critical need for affordable, comprehensive smart greenhouse systems for small to medium- scale farmers. A multifunctional robotic arm system is proposed, integrating precision irrigation, vision-based disease detection, and environmental monitoring to optimize crop health and resource use. The system employs Arduino-controlled stepper motors with linear rails for plant-to-plant navigation, capturing high-resolution images for CNN-based disease detection achieving 95% accuracy. A peristaltic pump enables targeted irrigation, reducing water consumption by 25%. Environmental sensors (DHT22, soil moisture, pH, MQ-7 gas sensor, NPK) continuously monitor critical parameters, transmitting data via ESP32 Wi-Fi to a cloud database. A web application provides real-time analytics and remote access, enabling farmers to make data-driven decisions from anywhere. The integrated platform addresses gaps in existing systems that lack full automation, rely on local storage, or remain prohibitively expensive. Primary data includes plant images and sensor readings from greenhouse trials, while secondary data leverages existing disease databases and technical literature. Hardware components include Arduino boards, various sensors, cameras, servo motors, and square linear rail sliders. The system demonstrates 30% faster disease outbreak response compared to manual methods, supporting sustainable agriculture through reduced labour, improved monitoring, and enhanced yields. This affordable solution democratizes precision farming technology, making it accessible to family farms previously excluded from high-tech agricultural advances.

**Keywords:** *Smart Greenhouse, Robotic Automation, Disease Detection, IoT Sensors, Precision Agriculture.*

# Farm and Learn: An Offline Mobile App Integrating Augmented Reality (AR), Artificial Intelligence (AI), and Game-Based Learning (GBL) for Child-Centered Agricultural Education

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**Abstract**

Agricultural education for children in rural Sri Lanka remains underserved despite its importance to national sustainability. Traditional materials lack interactivity, contributing to declining interest in farming among younger generations. This paper presents "Farm and Learn," a mobile application integrating Augmented Reality (AR), Artificial Intelligence (AI), and Game-Based Learning (GBL) to teach children aged ten and above the fundamentals of paddy cultivation. Developed using Unity 6, Blender 4.3, and ARCore with emphasis on offline functionality, the system comprises four modules: a Learning Module with locally contextualized content, an AR Module featuring three-dimensional models for farming tools with voice narration, a Game-Based Learning Module with interactive activities, and an AI Identification Module using a Convolutional Neural Network trained with YOLOv11n.pt in JupyterLab to identify paddy plants from images and real-time feed. The research employed a mixed-method approach including field visits, expert interviews, and pilot testing. Collaboration with the Rice Research Station, Labuduwa, and University of Kelaniya ensured scientific accuracy and technical validation. Development followed Agile practices with continuous stakeholder feedback. Testing with sixty users demonstrated high engagement, usability, and comprehension. The AI model showed reliable plant identification performance, supporting feasibility for future offline integration. This project contributes a scalable model for immersive agricultural education, demonstrating how emerging technologies can be synthesized into child-centered tools optimized for rural deployment while supporting national goals for food sustainability and technology-enhanced learning.

**Keywords:** *Augmented Reality, Agricultural Education, Paddy Cultivation, Game-Based Learning, Offline Learning, AI Plant Identification, Unity, YOLOv11n, Roboflow, JupyterLab, ARCore, Convolutional Neural Networks, Child-Centered Learning.*

# Secure Smart Door Lock System Using Blockchain Technology

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**Abstract**

With the rise of smart homes and IoT devices, smart lock systems are becoming increasingly popular, providing enhanced convenience and automation compared to traditional locks. However, many existing smart lock solutions suffer from security risks due to centralized home design, creating a single point of failure and exposing sensitive data to cyber threats. To address these limitations, this research proposes a secure smart door access system that integrates block chain technology. Blockchain offers a decentralized, tamper-proof ledger that ensures verifiable access records and prevents unauthorized data handling. The proposed system utilizes an ESP32 microcontroller connected to a solenoid lock, an RFID reader, and a fingerprint sensor for user authentication. Once authenticated, access requests are encrypted and validated through smart contracts deployed on a private blockchain. The mobile application developed using Flutter facilitates remote monitoring and control, providing users with flexibility and transparency. Furthermore, the integration of blockchain eliminates reliance on centralized servers, significantly reducing the risks associated with unauthorized access and intrusions. To evaluate system performance, this study contrasts a blockchain-based approach against traditional centralized smart lock systems, focusing on security, reliability, and usability. It is anticipated that the research outcomes will demonstrate an enhanced capability for providing recommendations against cyber-attacks, increased data integrity, and greater user trust. By integrating IoT hardware, mobile applications, and a centralized framework within the blockchain, this project offers a scalable and future-ready security solution that can be adapted for both residential and commercial environments. Overall, the proposed system addresses the shortcomings of traditional locks and centralized smart lock technologies by providing a multi-layered security approach that ensures transparency, accountability, and trust. This research contributes to the evolving knowledge in smart security systems, highlighting the role of blockchain in redefining physical access control.

**Keywords:** *Blockchain, Smart Door Lock, IoT Security, Access Control, Authentication*

# Machine Learning Smart Prescription Reader and Caretaker Assistant System

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**Abstract**

The growing elderly population and limited caregiving resources in Sri Lanka have created a serious gap in healthcare management, particularly in orphanages and senior care facilities. These institutions face persistent challenges such as staff shortages, manual record-keeping, and delayed medical responses, which often compromise residents' well-being. This study proposes the design and initial development of an AI driven Smart Prescription Reader and Caretaker Assistant System to address these critical issues through intelligent automation and contextual awareness. The proposed system integrates three complementary modules: a multilingual prescription reader based on convolutional neural networks (CNN) for digitizing handwritten prescriptions in Sinhala, Tamil, and English, an emotion recognition module employing computer vision and audio analysis to detect emotional states of residents in real time and an intelligent alert and recommendation engine that correlates medical, emotional, and environmental data to generate caregiver-specific notifications and dietary suggestions. Developed using Python, TensorFlow, OpenCV, and React Native within an Agile framework, the system is designed to operate effectively in low resource Sri Lankan environments while ensuring data privacy and ethical compliance. Preliminary design validation highlights the system's potential to reduce medication errors, improve emotional well-being, and enhance caregiver responsiveness through timely, context aware alerts. This paper presents the conceptual framework, design methodology, and planned evaluation strategy rather than a full-scale implementation. A pilot prototype will be tested to measure prescription recognition accuracy and emotion detection reliability. The long-term objective is to establish an integrated, affordable, and culturally adaptive care platform that enhances the quality of life for vulnerable residents in orphanages and elderly care homes across Sri Lanka.

**Keywords:** *Artificial Intelligence, Prescription Recognition, Emotion Detection, Healthcare Monitoring, Intelligent Alert System.*

# Reducing Network Downtime for Campus Area Networks by Implementing High Availability Networks

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**Abstract**

Campus Area Networks (CANs) are critical infrastructure supporting educational institutions' academic, administrative, and operational functions. However, traditional campus networks often lack sufficient redundancy and failover mechanisms, making them vulnerable to hardware failures, misconfigurations, and software crashes that can disrupt daily operations. This research addresses the pressing issue of network downtime by implementing a comprehensive High Availability (HA) network architecture incorporating redundancy and automatic failover systems. The study employs a multi-layered approach combining First Hop Redundancy Protocols (HSRP, VRRP, GLBP), Virtual Switching System (VSS) technology, Bidirectional Forwarding Detection (BFD) for rapid failure detection, and integrated monitoring solutions using Zabbix. Through analysis of the current network infrastructure at Horizon Campus, identification of failure points, and implementation of fault-tolerant topology, the research demonstrates significant improvements in network reliability. Performance evaluation comparing pre- and post-HA implementation shows substantial reduction in service disruptions and faster recovery times. The proposed solution provides a practical framework for educational institutions to enhance network reliability through cost-effective, scalable redundancy mechanisms that minimize single points of failure and ensure continuous service availability.

**Keywords:** *Network Infrastructure, High Availability, Redundancy, Failover, Campus Networks.*

# Leading Inclusively: Examining the Role of Inclusive Leadership in Advancing DEI Outcomes in Multicultural Workplaces

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**Abstract**

Purpose: This study investigates how inclusive leadership practices advance Diversity, Equity, and Inclusion (DEI) outcomes in multicultural organizational contexts. Scope: Focusing on multinational corporations in Sri Lanka, Singapore, and South Africa, the research explores how inclusive leadership behaviors influence trust, engagement, and belonging. Methodology: A qualitative exploratory approach was adopted using semi-structured interviews with 15 mid- to senior-level managers. Data were analyzed thematically using Braun and Clarke's (2006) six-phase framework with NVivo software. Key Findings: Four core themes emerged—Systemic Accountability, Cultural Empathy, Empowerment through Voice, and Conscious Fairness. These dimensions collectively highlight how adaptive leadership behaviors promote sustainable DEI outcomes. Limitations: The study is limited by its sample size and regional focus; future research should expand across industries and longitudinally.

**Keywords:** *Inclusive Leadership, DEI Outcomes, Multicultural Organizations, Qualitative Research, Empowerment*

# Marketing the Sri Lankan luxury mall experience: A case study of One Galle Face, Colombo

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**Abstract**

This case study looks into how One Galle Face (OGF) mall applies the entire 7Ps marketing mix to accomplish its strategic goals. It is one of the largest luxury retail complexes in Sri Lanka and part of the mixed-use complex operated by the Shangri-La Group; and this seven-story, 480,000-square-foot mall, was officially opened on November 8, 2019, providing home to more than 200 local and international companies (Daily FT, 2019). Its key tenants include PVR Cinemas, which has Sri Lanka's first kids' movie theater, Odel department store, Keells gourmet grocery, and Food Studio food court (Daily FT, 2019). The study explores how One Galle Face (OGF) uses all seven parts of the marketing mix; 1). Product, 2). Price, 3). Place, 4). Promotion, 5). People, 6). Process, and 7). Physical evidence; to attract both local and international customers. It draws from academic sources, business reports, and official documents to show how OGF blends luxury retail strategies with modern consumer trends in Sri Lanka. The mall focuses on creating a full experience through stylish design, friendly service, digital apps, and attractive promotions. These efforts help OGF increase customer visits, build a strong brand image, and stay ahead in the competitive shopping mall market. This case offers valuable lessons for luxury retail strategy in emerging markets.

**Keywords:** *Luxury retail, Marketing mix, One Galle Face, shopping malls, 7Ps*

# Perceived value and actual service quality in Airlines: A qualitative study from Google reviews

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**Abstract**

This qualitative study examines how perceived value interacts with service quality within the airline industry, with the analysis of user feedback from Google reviews. It applies an interpretive method to identify customer experience and value perception. Research implies that there is a gap between the perceived value of an airline service and the service that is being offered. Such traditional dimensions of service quality are tangibles, reliability, responsiveness, assurance, and empathy. In the case of online platforms of customer feedback, unstructured data based on consumer-generated content may be used to reconsider these dimensions as interpreted by the customer. This study systematically examines real customer reviews that have been posted on Google Reviews using sentiment analysis and qualitative content analysis. The reviews cover a wide range of traveler experiences, from reservations and check-in to in-flight amenities and after-flight assistance. An analysis of the regions where customer perceptions align or diverge from the required standards of airline service quality is made possible by text-mining techniques that classify attitudes associated with various service quality aspects. According to the study, the passengers are interested in practical elements, such as the condition of an aircraft, the cleanliness of the cabin, the comfort of the seats, and technology integration, whereas dissatisfaction or lack of expectations include assurance, empathy, and responsiveness.

**Keywords:** *Airlines, perceived, passengers, actual, service quality, reviews*

# The effectiveness of short-form video content in social media marketing for brand awareness of small businesses: A qualitative study of Instagram reels and TikTok in Sri Lanka

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**Abstract**

This qualitative study examines how perceived value interacts with service quality within the airline industry, with the analysis of user feedback from Google reviews. It applies an interpretive method to identify customer experience and value perception. Research implies that there is a gap between the perceived value of an airline service and the service that is being offered. Such traditional dimensions of service quality are tangibles, reliability, responsiveness, assurance, and empathy. In the case of online platforms of customer feedback, unstructured data based on consumer-generated content may be used to reconsider these dimensions as interpreted by the customer. This study systematically examines real customer reviews that have been posted on Google Reviews using sentiment analysis and qualitative content analysis. The reviews cover a wide range of traveler experiences, from reservations and check-in to in-flight amenities and after-flight assistance. An analysis of the regions where customer perceptions align or diverge from the required standards of airline service quality is made possible by text-mining techniques that classify attitudes associated with various service quality aspects. According to the study, the passengers are interested in practical elements, such as the condition of an aircraft, the cleanliness of the cabin, the comfort of the seats, and technology integration, whereas dissatisfaction or lack of expectations include assurance, empathy, and responsiveness.

**Keywords:** *Airlines, perceived, passengers, actual, service quality, reviews*

# How Digital Marketing Helps MSME Fancy Goods Outlets: A Case Study of Fancy Goods Outlets in Colombo District

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**Abstract**

The mini research study intends to assess the impact of digital marketing on MSME fancy goods outlets, located in the Colombo District. In the advent of increased activity on online platforms and consumer digital behavior, the MSMEs are steering toward digital strategies as measures for visibility, attraction of customers, and sales. The study was conducted to ascertain the effectiveness of digital marketing tools including social media, SEO, email marketing, and online advertisements. Primary data was gathered through interviews and sample surveys of MSME shop owners and customers. The findings suggest a myriad of digital marketing to customer interaction and sales performance while still facing challenges of resources and technical know-how. This research recognizes that digital marketing has changed the dynamics of businesses, especially for Micro, Small and Medium Enterprises (MSMEs) in the fancy goods industry in the Colombo District. The rapidly growing digital tools allow MSMEs to exceed market barriers and expand reach, resulting in enhanced branding, customer recognition, and competitive advantage. Digital marketing has the potential to enhance marketing communications at low costs using tools such as social media marketing, search engine optimization, online pay-per-click advertising, and consumer email engagement. With respect to full understanding of digital marketing, this study gave consideration to the perspectives of both shop owners and consumers.

**Keywords:** *Digital Marketing, MSMEs, Fancy Goods, Customer Engagement, Colombo District*

# Impact of Social Media Influencers on Consumer Behavior in Cosmetic industry; A case study of Colombo District, Sri Lanka

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**Abstract**

The research study intends to assess the impact of digital marketing on MSME fancy goods outlets, located in the Colombo District. In the advent of increased activity on online platforms and consumer digital behavior, the MSMEs are steering toward digital strategies as measures for visibility, attraction of customers, and sales. The study was conducted to ascertain the effectiveness of digital marketing tools including social media, SEO, email marketing, and online advertisements. Primary data was gathered through interviews and sample surveys of MSME shop owners and customers. The findings suggest a myriad of digital marketing to customer interaction and sales performance while still facing challenges of resources and technical know-how. This research recognizes that digital marketing has changed the dynamics of businesses, especially for Micro, Small and Medium Enterprises (MSMEs) in the fancy goods industry in the Colombo District. The rapidly growing digital tools allow MSMEs to exceed market barriers and expand reach, resulting in enhanced branding, customer recognition, and competitive advantage. Digital marketing has the potential to enhance marketing communications at low costs using tools such as social media marketing, search engine optimization, online pay-per-click advertising, and consumer email engagement. With respect to full understanding of digital marketing, this study gave consideration to the perspectives of both shop owners and consumers.

**Keywords:** *Digital Marketing, MSMEs, Fancy Goods, Customer Engagement, Colombo District*

# Why Sri Lankan Gem Dealers Prosper While Gem Miners Remain Poor; A qualitative study

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**Abstract**

The gem industry of Sri Lanka displays a persistent economic disparity between miners and dealers. Miners perform the most labor-intensive and risky work, but remain poor, while dealers grow extremely rich. This article examines the causes of this inequality and specifically discusses education, information access, and structural inequality in the gem business. Utilizing mixed research strategies, data were gathered through surveys, interviews, and literature research from dealers of Ratnapura and Elahera and miners. Findings determine that limited education, weak English and computer literacy, and limited market exposure make the miners unable to identify gem valuation and fair prices. Dealers use their information, capital, and overseas contacts to capture the lion's share of benefits. The study further learns that inefficient patron client relationships and weak regulation also perpetuate exploitation. The findings underscore the need for policy reforms, education initiatives, and equitable trade policies to create a more sustainable and equitable gem sector in Sri Lanka.

**Keywords:** *Gem Industry, Wealth Inequality, Education Disparity, Market Access, Sri Lanka*

# Impact of Online Reviews on Fashion E – Commerce Purchases in Sri Lanka

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**Abstract**

This study examines the impact of online reviews on purchasing decisions within the Sri Lankan fashion e-commerce context. With the growing use of numerous digital platforms, online customer reviews have increasingly replaced the physical evaluation of products, particularly in the fashion sector, where assessments of quality, fit, and style tend to be highly subjective. Using a qualitative approach, data were collected through semi-structured interviews with three regular online fashion shoppers. The thematic analysis revealed four main themes: the frequency and importance of reviews, trust and credibility, the effect of visual content, and the overall impact of reviews on purchase decisions. The results confirm that detailed and credible reviews, particularly those accompanied by photos or videos, increase consumer confidence, whereas negative reviews tend to discourage purchase intentions. The study recommends fostering a culture of genuine, visually supported reviews and actively engaging with customer feedback on review platforms to build credibility and strengthen consumer trust.

**Keywords:** *Online reviews, Purchasing decision, Fashion E-commerce, Consumer behaviour*

# Impact of Social Media Influencers on Consumer Buying Behaviour

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**Abstract**

The goal of this research is to analyse the role of influencers in the purchase intentions and decisions of consumers, with special focus on the impact of social media on purchase decisions. The research findings explain how trust and empathy develop due to the social media influencer's authenticity, relatability, and expertise, which impact consumers' purchasing decisions. Most consumers are motivated to follow social media influencers for entertainment, education, and product endorsements, and a considerable number of those consumers actually buy products after the influencers endorse them. The research further explains how brands aiming to improve customer engagement and conversion view influencer marketing as their key to success. The study demonstrates that the authenticity and engagement of social media influencers with consumers through social media drive consumer motivation, particularly on Instagram. The findings of this research are applicable in all sectors, but are most relevant in fast-moving industries such as cosmetics.

**Keywords:** *Social media influencers, consumer buying behaviour, authenticity, emotional engagement, purchase intention*

# A Critical Analysis of KPI-based Performance Management Approaches in Non-State Higher Education Institutions in Sri Lanka

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**Abstract**

This study covers everything that Key Performance Indicator (KPI) frameworks are found to be acting as systemic requirements of Non-State Higher Education Institutions in Sri Lanka: not just mere regulatory compliance constraints as traditionalists tend to assume. At the same time, the research has included performance measurement in ways that improve institutional effectiveness, alongside the integration of indigenous educational values and cultural preservation processes. Through an extensive multi-case qualitative study across three strategically chosen NSHEIs representing diverse institutional contexts, operational scales, and resource capacities, the research finds that KPI systems are mainly advanced institutional management technologies, embedding seamlessly within existing operational frameworks to trendily align planning cycles, comprehensive performance-monitoring systems, and strategic developments with wider educational effectiveness goals and institutional mission fulfillment.

**Keywords:** *Buddhist Pedagogy, Cultural Resistance, Educational Governance, Institutional Identity, Performance Management, Postcolonial Education*

# Mediating role of Counterproductive Work Behavior and Organizational Citizenship Behavior in the Relationship between Job Satisfaction and Employee Performance

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**Abstract**

The hospitality industry relies heavily on human resources to sustain operations and maintain a competitive advantage, making the identification of impactful HR practices increasingly important. Employee performance, shaped by individual capabilities and workplace behaviours, is a critical determinant of organisational success. Two key behavioural dimensions influencing employee performance are Organisational Citizenship Behaviour (OCB) and Counterproductive Work Behaviour (CWB). OCB refers to voluntary, positive behaviours that extend beyond formal job requirements and enhance organisational effectiveness, whereas CWB encompasses harmful actions that negatively affect organisational outcomes. Job satisfaction is recognised as a vital psychological factor that mediates the relationship between these behaviours and employee performance. The primary objective of this study is to investigate the mediating effects of OCB and CWB on the relationship between job satisfaction and employee performance in star-rated hotels in Colombo, Sri Lanka. A quantitative research design was adopted. The population consisted of 2,000 non-managerial employees, as determined by a field survey conducted by the researcher. A sample of 384 respondents was then selected using simple random sampling. Data were collected through structured questionnaires and analysed using SmartPLS version 4. Eight hypotheses were developed and tested, all of which were supported. Findings indicate that CWB has a negative impact on employee performance, while OCB exerts a positive influence. Furthermore, both OCB and CWB mediate the relationship between job satisfaction and employee performance. The study offers practical insights for human resource managers, emphasising the importance of strategies aimed at reducing counterproductive behaviours and promoting citizenship behaviours to enhance overall employee performance.

**Keywords:** *Colombo, counterproductive work behaviour, job satisfaction, organisational citizenship behavior, employee performance, star hotels*

# The Dual Role of Family Influence on University Students Engaged in Online Business: Support and Challenges

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**Abstract**

The shift of university students towards online businesses reveals a rich research field at the intersection of educational life and digital corporatisation. While previous studies have addressed students' entrepreneurial responsibilities and the influence of their families, there is a minimal focus on the dual role of family as both a support and a limitation in this context. This research fills that gap, highlighting that family influence strengthens the initiation and effectiveness of a business through various forms of support (financial assistance, emotional support and networking support), thus presenting challenges such as pressures related to education, risk aversion apprehensions, autonomy constraints, and performance misalignments. Utilising interpretivism as the research paradigm, data were collected through semi-structured interviews with seven students engaged in online businesses, under a qualitative and exploratory research framework. Through thematic analysis, it was shown that family support influences the initiation of business and the growth of entrepreneurship, thereby requiring students to navigate complex transactions between educational and business goals.

**Keywords:** *Family influence, student entrepreneurship, online business, university students, entrepreneurial support*

# Investment Behavior Among Sri Lankan Finance Professionals in the Private Sector

Tharushika K.A.D A, Bandara G.P.M.N.R, Sathkumara S.M.N, Senavirathna G.M.Y.R., Kavindi M.M, Kulasuriya K.P.R, Rajapaksha R.P.T.M., Yasara W.D.M.B.R
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**Abstract**

This research investigates the determinants of investment decisions among a valuable segment: Sri Lankan private sector finance professionals. Attributed to having excellent levels of financial literacy, these professionals contribute significantly towards the market, making their decision-making patterns a valuable domain of research. The study rigorously examines the impact of four broad categories of variables: socio-economic and demographic factors, financial risk tolerance, special investment issues, and fundamental motivational factors. A quantitative methodological approach was employed, utilizing first-hand information gathered through a close-ended structured questionnaire returned by 150 chartered accountants selected through simple random sampling from the national professional association. Higher-order statistical methods such as Pearson's correlation and time courteous regression models (Ordered Logit and Ordered Probit) were used to analyze the data. Empirical results indicate that motivational and psychological traits, financial risk tolerance, concerns, and incentives revealed a high, positive, statistically significant, and meaningful relationship with investment behavior. Conversely, conventional socio-economic and demographic traits showed a negative and non-significant correlation. This leads to the general conclusion that among financially aware professionals, intrapersonal psychological attributes overwhelmingly prevail over extrinsic demographic characteristics in determining investment. Such findings are of great value to financial institutions seeking to design tailor-made products, as well as to policymakers aiming to develop an adequate and flourishing financial market.

**Keywords:** *Finance Professionals, Financial Risk Tolerance, Socio – Economic & Demographic Factors, Concerns, Motives*

# Relationship Between Personal Financial Literacy and Personal Debt Management

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**Abstract**

This study examines the relationship between personal financial literacy and personal debt management among young Sri Lankans, with a particular focus on final-year university students preparing to enter the workforce or establish their own ventures. Although Sri Lanka records high general literacy rates, research consistently indicates low levels of financial literacy, reflected in poor saving habits, rising household indebtedness, and limited understanding of credit, budgeting, and long-term financial planning. These weaknesses pose significant challenges to individuals and prospective entrepreneurs, as inadequate personal financial management often contributes to venture instability, constrained access to formal financing, and elevated business failure rates. Understanding how young adults manage personal finances is therefore crucial for strengthening both individual financial well-being and the entrepreneurial landscape of the country. A quantitative, positivist research design was adopted, using a structured questionnaire administered to 300 final-year students from major state universities. The instrument, based on established financial literacy frameworks, measured financial knowledge, savings behaviour, borrowing practices, and confidence in managing debt. Data was analysed using descriptive statistics, Pearson correlation, and linear regression through SPSS (v25), with reliability confirmed via Cronbach's Alpha ($\alpha = 0.83$). The findings reveal a strong and statistically significant positive relationship between financial literacy and effective debt management ($r = 0.71$, $p < 0.01$). Students with higher financial knowledge demonstrated better budgeting practices, lower levels of debt stress, and more responsible borrowing behaviour. Regression analysis further showed that financial literacy accounted for 50% of the variance in debt management outcomes ($R^2 = 0.50$). Notably, many respondents reported difficulties in saving regularly and indicated limited understanding of interest rates and loan mechanisms, highlighting significant knowledge gaps. However, 72% expressed a strong interest in structured financial education, signalling demand for targeted interventions.

**Keywords:** *Financial literacy, Debt management, Personal finance, Financial education*

# Digital Financial Adoption and Financial Literacy of Millennial Professionals in Colombo, Sri Lanka.

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**Abstract**

This paper examines the financial practices, challenges, and opportunities for millennial professionals (25-40) in the Colombo financial industry, with the aim of exploring digital finance usage, long-term planning, and work-related financial stress. As the largest employee group in Sri Lanka, millennials have a significant impact on the country's financial situation and experience considerable economic stress. The research is based on a sequential explanatory mixed-methods design, which is supported by previous generational finance research (e.g., Perera and Silva, 2022). It is also based on a mixed-methods research design that integrates survey findings from 300 banking, insurance, and fintech professionals, as well as the results of 15 in-depth interviews. The quantitative phase employed stratified sampling by sector and level of employment to measure the usage of mobile banking, saving habits, debt management, and job satisfaction, using validated measures. The qualitative stage gave more insight into the semi-structured interviews on financial decision-making, career mobility and financial security barriers. The results demonstrate a significant contradiction, as 82% of the participants often access mobile banking, which is much higher than the representatives of the older generation, who are only 29% of those who consider formal investments, and 41% do not have any retirement plans. This highlights an important discrepancy between technology adoption and financial readiness. This disparity is caused by three main factors: economic pressure (58% of income is spent on basic needs, exceeding 45%), high student debt (average of 18 months of salary as graduates), and job dissatisfaction (73% of them want to work flexibly rather than with traditional benefits). There were also sectoral variations, as employees in fintech showed 22% higher investment opportunities than traditional bankers, with insurance workers indicating financial stress despite higher employment security.

**Keywords:** *Financial literacy, Debt management, Personal finance, Financial education*

# Impact of Behavioral Factors on Individual Investment Decisions of Equity Investors: A Study in the Colombo Area

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**Abstract**

Behavioural finance examines how human psychology and cognitive biases influence investment decisions. These factors often lead investors away from rational thinking and create unusual trends in financial markets. This study explored these behavioural influences in the Colombo region of Sri Lanka, which is important for the Colombo Stock Exchange (CSE). The research focused on four behavioural factors: representativeness, overconfidence, availability heuristic, and the herding effect, and how they affect individual equity investors' decision-making. Data were collected using a structured questionnaire administered to 100 equity investors, and the responses were analysed using descriptive statistics, correlation, and regression methods. Correlation analysis indicated that all four factors were linked to investment behaviour. However, regression analysis showed that only the availability heuristic and the herding effect had a significant impact on investor decisions. Representativeness and overconfidence did not show any major effect. Additionally, demographic factors such as age, gender, and educational level had a minimal influence on how investors made their decisions. These findings suggest that despite ongoing awareness programs and educational efforts by the CSE's local branch, behavioural biases persist among individual investors. Investors tend to rely on easily accessible information and follow the actions of others in the market, which makes purely rational decision-making difficult. From a practical perspective, this study has two key implications. First, it highlights the need to improve investor education programs to tackle behavioural biases more effectively. Second, it emphasises the role of policymakers and regulators in creating strategies that promote rational investment practices and ensure that all market participants have access to reliable and transparent information. Beyond its practical contributions, the study adds to the growing literature on behavioural finance in Sri Lanka and sets the scene for future research.

**Keywords:** *Behavioral finance, Cognitive Biases, Availability heuristic, Herding effect, Colombo stock exchange (CSE)*

# A Comparative Analysis of Digital Marketing's Impact on Consumer Behaviour in Urban vs. Rural FMCG Markets in Sri Lanka.

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**Abstract**

The rise of digital technologies has significantly reshaped the way businesses communicate with consumers, influencing purchasing behaviour and decision-making processes. This study examines the impact of digital marketing on consumer purchasing decisions, with a special focus on the Fast-Moving Consumer Goods (FMCG) industry in the Colombo District of Sri Lanka. Four digital marketing channels, email marketing, online advertising, social media marketing, and mobile marketing, were analysed to determine their role in shaping consumer behaviour. Digital marketing is increasingly viewed as a powerful tool that enables organisations to directly engage with customers, build brand awareness, and foster loyalty in a competitive business environment (Jobber & Ellis-Chadwick, 2013; Yasmin, Tasneem, & Fatima, 2015). Quantitative data were collected from 250 respondents through a structured questionnaire, analysed using SPSS (version 25). Multiple regression and correlation analyses reveal that social media marketing and mobile marketing have a significant influence on consumer purchase decisions ($R^2 = 0.72$, $p < 0.05$), while email marketing and online advertising exhibit a moderate yet positive impact. Findings emphasise that Colombo consumers are increasingly driven by interactive, mobile-based, and social media promotions.

**Keywords:** *Digital Marketing, Purchasing Decisions, Social Media Marketing, Colombo District, FMCG*

# Determinants of Financial Behaviour of the Final Year Undergraduates at Horizon Campus, Malabe

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**Abstract**

An individual's long-term financial stability and general quality of life are significantly influenced by their overall financial behaviour. In fact, this is especially important for undergraduates, a group on the verge of achieving financial independence, who must navigate an increasingly complex economic environment. Sound financial habits are largely determined by financial literacy, financial attitude, and financial self-efficacy, according to a wealth of recent international studies (Lusardi & Mitchell, 2014; Bandura, 1997). There is a sizable empirical gap in the Sri Lankan context, nevertheless, where socio-economic circumstances might have an impact on these correlations. Therefore, the purpose of this study was to investigate how these factors influenced the financial behaviour of final-year undergraduates at Horizon Campus in Malabe. The study used a cross-sectional survey strategy to operationalise its quantitative, deductive methodology. A conceptual model was created that postulated financial behaviour is directly and positively impacted by financial literacy, financial attitude, and financial self-efficacy. Data were acquired from a randomly selected sample of 247 final-year undergraduates using a carefully standardised online questionnaire. Partial Least Squares-Structural Equation Modelling (PLS-SEM), a method selected for its resilience in predicting application and managing complex models (Hair et al., 2017), was then used to examine the data. The measuring model showed convergent validity and high reliability. The structural model's path analysis showed that each of the three proposed linkages was statistically significant. The strongest predictor was financial literacy ($\beta = 0.42$, $p < 0.01$), which was followed by financial attitude ($\beta = 0.25$, $p < 0.05$) and financial self-efficacy ($\beta = 0.31$, $p < 0.01$).

**Keywords:** *financial behaviour, financial literacy, financial self-efficacy, financial attitude, undergraduates*

# Effects of Descoping and Omitting Works in the Construction Industry in Saudi Arabia

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**Abstract**

This study investigates the effects of descoping and omission strategies in the Saudi Arabian construction industry, with specific reference to the ongoing development goals of Vision 2030. It examines how these practices influence project budgets, timelines, quality standards, and stakeholder satisfaction, while exploring their frequency, motivations, and long-term consequences. Although previous studies have addressed various aspects of the Saudi construction sector, the enduring impacts of descoping and omissions remain insufficiently explored, particularly within the country's evolving economic, technological, and regulatory context. Using a mixed-methods approach, the research collects primary data through surveys of industry practitioners and triangulates it with secondary sources to analyze underlying drivers, implementation barriers, and the influence of scope reductions on performance metrics. Findings reveal that descoping is highly prevalent in government-funded megaprojects, commonly driven by time constraints, design modifications, and budget limitations; however, while such actions may offer short-term gains, they often lead to reduced quality, stakeholder dissatisfaction, and potential legal challenges. The study concludes that descoping and omissions create a paradox between perceived short-term efficiency and actual long-term project sustainability, underscoring the need for improved planning and stakeholder alignment to ensure the success of major national development initiatives.

**Keywords:** *Saudi construction sector, Descoping, Omissions, Project management, Vision 2030, BIM.*

# Evaluating the Impact of Relationship Management on Successful Project Delivery in Sri Lanka

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**Abstract**

This study evaluates the impact of relationship management on successful construction project delivery in Sri Lanka. Despite technical advancements and modern project methodologies, Sri Lanka's construction sector continues to experience delays, cost overruns, and stakeholder dissatisfaction. A key contributor to these issues is poor relationship management influenced by cultural norms, hierarchical structures, and informal communication practices. This research investigates how stakeholder relationships affect project outcomes across small, medium, and large-scale construction projects in Sri Lanka. A qualitative methodology was adopted, underpinned by interpretivism, to explore the experiences and perceptions of industry professionals. Data was collected through some case studies and semi-structured interviews with clients, contractors, consultants, and project managers. Thematic analysis was used to identify patterns and challenges in relationship dynamics, stakeholder communication, and conflict resolution practices. The results indicate that project size significantly influences communication methods and relationship styles. Small projects depend heavily on informal, trust-based communication; medium projects mix formal and informal strategies; and large projects use digital tools like BIM, yet face slow decision-making due to bureaucratic delays. Miscommunication, conflicting expectations, and a lack of stakeholder engagement were key issues affecting project performance across all scales. Cultural values such as respect for seniority and indirect communication styles further complicated collaboration. The study concludes that effective relationship management, including structured communication, early stakeholder engagement, and conflict resolution frameworks, improves project efficiency, reduces disputes, and enhances stakeholder satisfaction. It recommends that Sri Lankan construction firms adopt hybrid relationship models that integrate both cultural awareness and formal management tools.

**Keywords:** *Relationship, Stakeholder, Communication Strategies, Cultural Influence.*

# Evaluating the Impact of Contractual Clarity on Reducing Construction Claims

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**Abstract**

The research investigates how contractual transparency affects the reduction of claims in the construction industry. The work employs a mixed-methods approach, combining quantitative survey data from 109 construction practitioners with qualitative analysis to investigate the relationship between transparent contract terms and claim frequency rates. The research addresses a relevant industry problem in which insufficient, clear contractual conditions frequently result in disputes, delays, and cost overruns. The study demonstrates contractual clarity to reduce construction claims significantly, with 92.7% of the respondents sensing that unambiguous contract terms reduce claim incidence ($p < 0.001$). Regression analysis demonstrates contract clarity to explain 67.2% of the variance in claim occurrence, the strongest single determinant for dispute reduction. The study demonstrates poorly defined scope of work to be the most critical contractual issue (93.6% agreement), followed by inadequate change order procedures (78.0%) and lack of clarity in risk allocation (76.2%). Highlighted results include the moderating effect of the adoption of technology, in the form of Building Information Modeling (BIM), which reduces claims by 34% compared to non-BIM practitioners. Standard form contracts (FIDIC/NEC) are shown to outperform, with 23% fewer claims and 31% less claim value compared to bespoke contracts. The study also reveals considerable training deficiencies, with only 44% satisfied with contract interpretation training, while 89.9% confirm that increased training would benefit the profession. The research contributes to construction management knowledge through the firm's empirical confirmation of the clarity-claims nexus and the extraction of industry development practical guidelines. These include the implementation of formalized contract review procedures, the use of standard contract forms, the integration of BIM technology into contract administration, and the development of specialist contractual clarity training programs. The implications inform policy development and industry standardization for dispute reduction and project performance improvement in the construction sector.

**Keywords:** *Construction claims, contractual clarity, Building Information Modeling, contract management, dispute resolution*

# Application Of Sustainable Concepts to Reduce Energy and Water Consumption in The Building Sector in Qatar

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**Abstract**

Building construction in Qatar consumes a large proportion of energy and water, owing mainly to the country's hot-arid climate and high cooling energy demand, as well as its reliance on desalinated water as a supply to the municipal system. Such reliance establishes a direct connection between energy consumption, water generation, and GHG emissions, which puts sustainability in the construction at the national priority level. This paper seeks to address how the smart ideas or concepts of sustainability can be utilized to improve energy usage and water usage in the building industry in Qatar, in terms of how the country has embraced them, but also the challenges being faced, as well as the opportunities. A quantitative approach to the research was taken using an organized questionnaire-based survey, directed to professionals working in the construction industry. There were 103 responses received, and descriptive statistics were utilized to summarize data trends and the Relative Importance Index (RII). The findings indicate that most construction professionals in Qatar are highly conscious of the issue of sustainability. In addition, it is acknowledged that the climate of Qatar exerts a strong impact on the extreme effects on the consumption of energy and water resources. Many of the widely applied measures are passive building design, an effective HVAC system, LED, and low-flow plumbing fixtures. The most relevant obstacles were high initial cost, low government encouragement, and the absence of special knowledge or training. According to the study, it advises that policy enforcement should be strengthened, financial incentives provided, professional training programmes broadened, digital tools, such as Building Information Modelling (BIM) incorporated, and promotion of the population raising awareness of the problem.

**Keywords:** *Sustainable buildings, Energy efficiency, Water conservation, Qatar, Green construction*

# Evaluating the Feasibility of Green Concrete in Sri Lankan Medium-Scale Building Construction for Improved Environmental Sustainability

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**Abstract**

This study aims to evaluate the feasibility of adopting green concrete in Sri Lanka's medium-scale construction sector, with a focus on its environmental and economic implications. The purpose is to explore how sustainable construction materials can be integrated into developing countries that face challenges related to cost, policy, and awareness. This research addresses the gap in understanding Sri Lanka's readiness for adopting green concrete in medium-scale construction. While global interest in sustainable construction is rising, few local studies explore the practical challenges and readiness in developing countries. The study offers a fresh perspective by stressing the need for financial incentives, supportive policies, and stronger industry collaboration. It concludes that bridging this gap requires stakeholder engagement, government support, efficient supply chains, and clear production and application standards. Gather data from randomly selected professionals within the construction industry. This approach facilitated the analysis of patterns, relationships, and key factors influencing the adoption of green concrete. Secondary research, including industry reports, academic literature, and case studies, was conducted to support and validate the primary data findings. The research findings highlight that green concrete offer notable environmental benefits, including reduced carbon dioxide emissions and improved material efficiency. However, its adoption in mainstream construction is hindered by several challenges, such as high initial costs, inconsistent quality control, limited technical expertise, and low awareness. Nevertheless, stakeholders acknowledge green concrete's potential to enhance sustainability and reduce environmental impact in construction activities. The study recommends market-based incentives, mandatory policy support, and national awareness programs to overcome current adoption barriers. Establishing reliable supply networks and setting clear guidelines for green concrete usage are also critical. By addressing these interconnected challenges, Sri Lanka can accelerate the implementation of green concrete, contributing to environmentally sustainable construction practices and delivering long-term benefits to the industry.

**Keywords:** *Environmental Impact, Sustainable Construction, Policy Support, Technical Challenges, Innovation Adoption*

# An Analysis of Cost Estimate and BOQ Conflicts Impacting the Successful Completion of Luxury Projects in KSA

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**Abstract**

Saudi Arabia's luxury construction sector is expanding rapidly under Vision 2030, yet it faces persistent challenges such as cost overruns, project delays, and stakeholder conflicts. A key contributor to these issues is the misalignment between cost estimates and Bills of Quantities (BOQs), which are essential for financial planning and scope control. While technologies like Building Information Modeling (BIM) and project management software are increasingly used to improve cost accuracy, they often fall short due to fragmented communication and inconsistent documentation practices. Existing research has highlighted these tools but lacks a focused examination of how discrepancies between cost estimates and BOQs specifically affect luxury projects in the Kingdom. This study addresses that gap by surveying experienced professionals to identify the root causes of these conflicts, such as unclear scope definitions, rushed documentation, and inconsistent specifications, and their impact on project deliverables. The findings reveal that budget overruns and scheduling delays are the most affected outcomes, with contractors and clients being the most influential stakeholders. Coordination between these two parties plays a critical role in project performance, and any misalignment in expectations, financial planning, or decision-making processes can significantly amplify project risks. To mitigate these issues, the study proposes practical strategies including early planning, standardized cost protocols, enhanced interdepartmental communication, and robust change management. These insights aim to improve cost alignment, stakeholder collaboration, and overall project performance in Saudi Arabia's high-end construction landscape.

**Keywords:** *Cost Estimates; BOQ; Luxury Projects; Construction; Conflicts; Saudi Arabia*

# The Challenges Faced by Contractor Quantity Surveyors in Dubai Due to Insufficient Proficiency in Using Quantity Take-Off Software During the Post-Contract Phase

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**Abstract**

Contractor quantity surveyors play a critical role in ensuring cost control, resource management, and overall project efficiency. However, challenges arise in the post-contract phase due to insufficient proficiency in Quantity Takeoff (QTO) software—an essential digital tool for accurate measurement and cost estimation. This research explores the core difficulties faced by contractor quantity surveyors in effectively utilizing QTO software and examines the broader implications on project delivery and financial performance. The adoption of these tools has become critical for enhancing project efficiency and cost accuracy. However, despite their significant potential to streamline cost estimation and resource management, QTO software is often underutilized. Key barriers to effective use, such as insufficient specialized training, limited access to necessary resources, and a lack of familiarity with the software's advanced functionalities. These challenges limit the effectiveness of QTO software. The study used a mixed-methods approach, combining a literature review with questionnaire data from construction professionals in Dubai. Survey data were analyzed statistically to identify patterns, while qualitative responses were examined through thematic analysis for deeper insights. The findings reveal a consistent pattern of under preparedness among quantity surveyors in utilizing digital tools effectively during the post-contract phase. The study found that reluctance to adopt new technologies and inadequate training hinder the digital transformation of quantity surveying. Contractor quantity surveyors lack sufficient digital competency, particularly in the post-contract phase, leading to underuse of QTO software despite its benefits. The research recommends continuous training, better access to digital tools, and a stronger organizational culture that supports digital adoption. Enhancing these capabilities is essential for improving cost accuracy, risk management, and project success in Dubai's rapidly evolving construction sector.

**Keywords:** *Quantity takeoff (QTO), quantity surveyors, cost estimation, construction digitalization, Dubai*

# The Case Study on the Cost Implications of Infrastructure Projects Suspensions in Qatar

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**Abstract**

Infrastructure development is central to Qatar's growth strategy under the Qatar National Vision 2030, which prioritizes modernizing infrastructure to drive economic diversification, enhance quality of life, and strengthen the country's position as a global hub. Despite these ambitions, the sector has faced persistent challenges due to the recurrent suspension of large-scale infrastructure projects. These suspensions are often triggered by economic instability, fluctuating oil prices, changes in funding priorities, or unforeseen political and global market conditions. Such interruptions create a range of financial and operational difficulties for various stakeholders, including government bodies, contractors, suppliers, and investors. This research investigates the cost implications of infrastructure project suspensions within Qatar, identifying both direct and indirect financial burdens. Direct costs include contract penalties, expenses for idle labor, and depreciation of unused equipment. Indirect costs involve reputational damage, increased financing costs, reduced investor confidence, and delays in expected economic returns.The study underscores the critical need for more resilient contractual frameworks, particularly through the standardization of suspension clauses to protect all parties and ensure fair allocation of risks. Furthermore, it advocates enhanced regulatory efficiency to reduce bureaucratic delays during project restarts, as well as the integration of early-stage risk assessment tools to identify potential triggers for suspension before they escalate. The research also highlights the importance of fostering Public–Private Partnerships (PPPs) as a mechanism to share financial risks and strengthen the capacity to sustain projects during periods of uncertainty. This study fills a key gap in the literature by offering new insights into the financial impacts of project suspensions in Qatar. It provides practical recommendations for policymakers, contractors, and investors to strengthen legislation, improve operational strategies, and manage funding risks. Ultimately, the findings aim to enhance resilience, financial sustainability, and continuity in Qatar's infrastructure development despite unexpected disruptions.

**Keywords:** *Infrastructure Development, Project Suspension, Qatar National Vision 2030, Financial Risks, Public–Private Partnerships*

# Developing Safety Management Components for Construction Projects in Qatar

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**Abstract**

Qatar's rapid urbanization, extreme climatic conditions, and reliance on a predominantly expatriate workforce have intensified safety challenges within its construction sector. As the industry continues to grow, the need for robust and context-specific safety management strategies has become increasingly critical. This study investigates the key elements that influence safety performance and seeks to develop a framework to strengthen safety management practices across construction projects in Qatar. A mixed-methods research design was employed, integrating qualitative site observations with a structured questionnaire survey administered to 82 construction professionals, including safety officers, engineers, and project managers. The collected data were analyzed using the Relative Importance Index (RII) to prioritize the factors that most significantly affect safety outcomes. The findings indicate that the most influential safety management components, ranked in descending order of importance, are: (1) Training and awareness initiatives (RII: 85.4%); (2) Proper use of Personal Protective Equipment (PPE) (RII: 82.3%); (3) Effective enforcement and active supervision (RII: 79.8%); and (4) Worker behavior and overall safety culture (RII: 76.2%). These results underscore the need for continuous capacity building, stricter compliance monitoring, and targeted interventions to promote safer worker behavior. Overall, the study contributes to a better understanding of Qatar's construction safety landscape and provides practical guidance for industry stakeholders and policymakers to develop more effective, sustainable, and culturally responsive safety management systems.

**Keywords:** *Construction Safety, Qatar, Safety Management, Risk Assessment, Safety Culture, Relative Importance Index (RII)*

# Digital Twin Technology for Sustainable Infrastructure Delivery: A Game Changer for Quantity Surveyors

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**Abstract**

The integration of Digital Twin (DT) technology into the construction industry is revolutionizing the delivery of sustainable infrastructure projects. Digital Twins, virtual replicas of physical assets, enable real-time monitoring, predictive analysis, and optimized decision-making, thus supporting the principles of sustainable construction. This study explores the transformative impact of DT on the roles and responsibilities of Quantity Surveyors (QSs) in achieving sustainable infrastructure delivery. Through a qualitative review of scholarly articles, industry reports, and case studies, this paper highlights how DT facilitates efficient resource utilization, reduces rework, and minimizes embodied carbon emissions by enabling early design simulations and lifecycle cost analysis. Findings indicate that QSs leveraging DT can proactively identify risks, provide accurate cost forecasting, and support sustainable decision-making throughout the project lifecycle. This study adopts a qualitative thematic review of 20 high-quality sources published between 2010 and 2025, identifying key benefits, barriers, and strategies for DT adoption in sustainable construction. The findings reveal that DT enhances sustainability through real-time data integration, lifecycle cost optimization, and improved decision-making support for QSs. The paper recommends upskilling QSs with digital competencies, promoting industry-academia collaboration, and implementing supportive government policies to accelerate DT adoption and realize its full potential for sustainable infrastructure delivery.

**Keywords:** *Digital Twin, Sustainable Construction, Quantity Surveyors, Infrastructure Delivery, Lifecycle Costing*

# A Case Study on Challenges Faced by Women in the Construction Industry and Gender Equality

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**Abstract**

The construction industry remains one of the most male-dominated sectors globally, with women facing persistent challenges such as gender discrimination, wage disparity, and limited career advancement opportunities. This study investigates the barriers encountered by women, particularly in Quantity Surveying, and evaluates the effectiveness of current gender equality initiatives in the construction industry. A mixed methods approach was employed, combining quantitative surveys and semi-structured qualitative interviews to gather comprehensive insights from women working in various construction roles. Quantitative data were analyzed using descriptive statistics, while interview data were thematically analyzed to identify recurring patterns and underlying issues. The findings reveal that 62.5% of participants believe career advancement opportunities are unequal, 75% reported the absence of mentorship programs, and 62.5% experienced poor work-life balance support. Furthermore, 37.5% of respondents indicated experiencing gender bias, including exclusion from leadership and high-visibility projects. Although several organizations have introduced diversity initiatives such as flexible working arrangements and equality policies, these measures were found to be largely superficial and weakly enforced. The study concludes that while awareness of gender diversity has increased, systemic and cultural barriers continue to limit women's participation and progression in construction. Recommendations include implementing formal mentorship programs, establishing transparent promotion and pay structures, and introducing flexible work arrangements to retain female talent. These measures are essential to foster inclusivity, reduce gender disparities, and promote sustainable career growth for women in the construction sector.

**Keywords:** *Women in construction, gender equality, mentorship, inclusivity, career barriers.*

# The Role of Quantity Surveyors in Avoiding Disputes Related to Change Orders in the Pre-Contract Stage

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**Abstract**

The construction industry frequently encounters disputes arising from change orders, which are modifications to the original contract scope during project execution. These disputes often lead to cost overruns, delays, and strained stakeholder relationships. Quantity Surveyors (QS) play a critical role in managing change orders, particularly during the pre-contract stage, to minimize conflicts. This study aims to investigate how QSs proactively prevent disputes related to change orders in the pre-contract stage. By reviewing relevant literature and employing qualitative data gathered through semi-structured interviews with ten experienced Sri Lankan QS professionals, the study identifies key interventions such as detailed scope definition, thorough cost planning, clear contractual documentation, and early stakeholder communication. The findings highlight the importance of the QS's expertise in risk identification, cost estimation, and contract administration, which collectively contribute to dispute mitigation. Recommendations are made for enhancing QS involvement early in the project lifecycle to ensure better clarity and agreement on potential changes. The study emphasizes that effective management of change orders by quantity surveyors in the pre-contract stage can significantly reduce disputes, improve project outcomes, and foster collaborative relationships among project parties.

**Keywords:** *Quantity Surveyors, Change Orders, Dispute Avoidance, Pre-Contract Stage, Construction Management*

# Barriers to Implement Agile Project Management Methodology in the International Construction Industry, Generally, and in the Kingdom of Saudi Arabia, Specifically

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**Abstract**

Agile Project Management, originally used in software development, is gaining attention in construction due to its potential to improve project success in a complex and unpredictable industry. This study examines how Agile principles of flexibility, collaboration, and continuous improvement can enhance project delivery, risk control, and stakeholder satisfaction in the construction sector. The choice of method is driven by a literature review of earlier studies to enable a comparison between the implementation of Agile in the construction industry, including the different Agile methodologies, and the frequently used Agile frameworks in the construction sector, to touch base with the covered methodologies theories within the previous studies and the gaps in those research that should be discussed and covered in this research. To gather practical information, a questionnaire was constructed and administered to the Project Managers, Contractors, and other professionals involved in the construction of project management. The survey is designed not only to evaluate their previous experiences, perceptions, and difficulties encountered in implementing Agile methodologies in real construction projects but also, to achieve these objectives, the collected data will be analyzed to estimate frequency, examine barriers for successful implementation, and factors that lead to the successful application of Agile practice in the construction industry, especially in the Kingdom of Saudi Arabia which now has a giant leap through massive construction projects serving 2030 Vision of Saudi Arabia which was launched as a blueprint that will establish Saudi Arabia as a global leader through a huge number of Giga-Projects. This research aims to shed light on the effective methods of Agile Project Management application in the construction industry, by offering a practical recommendation to enhance project performance through a productive implementation of Agile in the Saudi Arabian construction industry, including public and private sectors, and achieving the optimum utilization of the advanced project management methodologies serving the Saudi transformation effectively.

**Keywords:** *Waterfall, Agile, Hybrid, Scrum, KANBAN*

# The Role of Quantity Surveyors in Effective Contract Management for Construction Projects

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**Abstract**

No construction project succeeds without proper contract management, which ensures effective budget control, quality assurance, risk mitigation, and smooth collaboration among stakeholders. Quantity Surveyors (QSs) play a vital role in contract administration, cost control, risk handling, and dispute resolution throughout all project stages. Their responsibilities extend to preparing contractual documentation, monitoring variations, evaluating claims, verifying payments, and ensuring compliance with contractual obligations. By maintaining transparency and accuracy in financial and contractual processes, QSs help prevent conflicts, support timely decision-making, and contribute significantly to the overall success and accountability of construction projects. This study examined Quantity Surveying (QS) duties, challenges, and the impact of digital tools through a survey of 100 practicing QS professionals. Key responsibilities explored included purchasing, cost estimation, contract negotiation, risk assessment, and dispute resolution. Findings revealed that QSs face significant challenges, such as frequently changing project scopes, complex legal frameworks, delayed payments, and miscommunication within project teams, which can adversely affect project timelines, budgets, and overall efficiency. Digital tools, including Building Information Modeling (BIM), contract management software, and cost-estimation applications, have shown potential to enhance accuracy, collaboration, and workflow efficiency. However, barriers such as inadequate training, organizational resistance, and limited standardization hinder their widespread adoption. The study recommends enhancing QSs' skills through targeted training and improving digital tool adoption with standardized procedures for scope changes, risk assessment, and contract management. Strengthening collaboration among clients, contractors, and project managers can reduce disputes and improve project outcomes. By addressing these challenges, QSs can boost efficiency, transparency, and accountability, advancing their role in the modern, digitized construction industry.

**Keywords:** *Quantity Surveyors, Change Orders, Dispute Avoidance, Pre-Contract Stage, Construction Management*

# Adopting Artificial Intelligence (AI) In Quantity Surveying Practices for Sri Lankan Construction Projects to Enhance Cost Management

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**Abstract**

This research explores the integration of Artificial Intelligence (AI) in quantity surveying practices within Sri Lanka's construction industry, addressing a significant gap in current knowledge. The study was conducted through a combination of literature review, expert surveys, and data analysis, focusing on the application of AI in cost management and project financial performance. The primary data collection was through a questionnaire, which makes this quantitative research. Key findings indicate that while AI has the potential to significantly enhance cost accuracy, efficiency, and decision-making, its adoption in Sri Lanka is hindered by challenges such as high implementation costs, lack of expertise, and resistance to change. The study suggests targeted training, industry collaboration, and the development of unified AI platforms as strategies to overcome these barriers. The implications of this research are substantial, offering valuable insights for professionals and stakeholders seeking to modernize and improve the construction sector in Sri Lanka.

**Keywords:** *Artificial Intelligence (AI), Quantity Surveying, Sri Lanka, Cost Management, Digital Transformation*

# Risk Analysis Between Contractor and Subcontractor in Building Projects in Sri Lanka

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**Abstract**

The construction industry in Sri Lanka faces persistent risks involving finance, time, quality, contractual responsibilities, and external uncertainties such as economic instability and political influence. These risks are often shared between main contractors and subcontractors; however, the absence of a structured risk allocation mechanism leads to disputes, cost escalations, and project delays. This study examines how risks are perceived and allocated between contractors and subcontractors in building projects, to propose a fair and practical framework for risk distribution. The research adopts a quantitative approach, using a structured questionnaire distributed among ICTAD C1 and EM1 grade professionals representing both main contractors and subcontractors. Data was analyzed using the Relative Importance Index (RII) to identify and rank the most critical risk factors. Findings revealed 29 key risks, of which 17 were identified as highly significant, including working capital constraints, cost overruns, construction delays, unclear responsibility allocation, material price fluctuations, and design deficiencies. While both parties agreed on the shared nature of political and natural risks, financial and operational risks were often transferred to the other party, reflecting issues of trust and contractual imbalance. The study highlights the urgent need for transparent risk-sharing mechanisms and professional involvement, such as quantity surveyors, to establish neutrality in allocation. The implications suggest that adopting a structured risk matrix and register can minimize disputes, enhance collaboration, and improve project performance in the Sri Lankan construction sector. The study concludes by recommending clear contractual definitions, joint risk workshops, and capacity building to strengthen future risk management practices.

**Keywords:** *Risk Allocation, Contractors, Subcontractors, Sri Lanka, Construction Management*

# Enhancing risk management strategies to minimize delays in building projects in Saudi Arabia

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**Abstract**

Building projects are vital to Saudi Arabia's economy but face high risks that can affect timely completion. Strengthening risk management to reduce delays is essential for saving time and costs. This study aimed to enhance risk management strategies to minimize the delays in building projects in Saudi Arabia. The study employed the quantitative approach based on a structured questionnaire survey to collect the required information. The survey was administered online to 67 experienced professionals from Saudi Arabian construction firms and drawn from a finite population of 42, with a response rate of 62.69%. Results were analyzed using descriptive statistics and the Relative Importance Index (RII). The findings revealed that both internal inefficiencies and external uncertainties play critical roles in delaying building projects in Saudi Arabia. Financial backing, technological integration, cultural readiness, and undervalued roles of leadership and training were indicated as the key areas where targeted improvement is necessary. Enhancing resources, integration of digital technologies, capacity building training for staff, and leadership engagement act as the integral practices that impact delay mitigation, especially in building projects. Notably, improved risk management practices could meaningfully reduce delays in the context of Saudi Arabia. Further strategic attention is required for risk assessment, adoption of modern digital tools, and better communication, while also recognizing areas such as leadership and stakeholder engagement. In conclusion, the study emphasizes the necessity for the construction industry to proactively engage in risk management practices. To achieve this, focusing on critical success factors becomes paramount. The insights derived from this study have the potential to offer valuable guidance to stakeholders, policymakers, and practitioners, serving as a practical tool for risk management and fostering harmonious working relationships among the parties involved. Ultimately, the study will contribute to a more efficient and effective risk management in minimizing building project delays in the construction industry of Saudi Arabia.

**Keywords:** *Building projects, Construction delays, Delay Mitigation Strategies, Risk Management, Saudi Arabia*

# Legal And Statutory Framework Governing Adjudication in The Sri Lankan Construction Industry

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**Abstract**

The lack of legislative adjudication and the limitations of litigation contribute to ongoing difficulties for the Sri Lankan construction sector in effectively resolving disputes over contracts. This paper examines Sri Lanka's legal and legislative framework for adjudication, highlighting the necessity of formal laws to facilitate more efficient and fair resolution of disputes. It evaluates current practices, legal gaps, and industry awareness. The findings illustrate that while adjudication is available under the contractual conditions of FIDIC and ICTAD, it is not statutory, which results in inconsistent enforcement and limited utilization. Weak regulatory frameworks, stakeholder resistance, and a lack of awareness are major obstacles. Results suggest that Statutory adjudication may significantly reduce off delays, increase payment security, and enhance project efficiency in comparison with nations like the UK, Australia, and Malaysia. The study concludes that professional training and awareness in initiatives, along with the implementation of a legislative adjudication framework, can improve conflict resolution in Sri Lanka. In order to bring national practices into line with international norms and equity, openness, and productivity in the construction industry, it emphasizes the significance of policy reform and stakeholder participation.

**Keywords:** *Dispute Resolution, Adjudication, Statutory Right, Sri Lanka*

# Strategies, Challenges, and Contributions of Quantity Surveyors in Promoting Green Building Practices in Sri Lanka

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**Abstract**

The construction industry is vital for national development but contributes to environmental degradation. Sustainable construction, particularly green building practices, addresses these challenges. Quantity Surveyors play a key role integrating sustainability into cost management, procurement, and planning, aligning economic, environmental, and social goals, and driving Sri Lanka's move toward sustainable construction. This study explores QS strategies, challenges, and their role in promoting green building in Sri Lanka, using a mixed-methods approach: a survey of 102 construction professionals, 12 interviews with QSs and sustainability experts, and case studies of projects like Clear Point Residencies and Colombo Port City. This triangulated methodology provided both quantitative data and qualitative perception, thereby strengthening the findings. The results indicate that QSs regularly executed strategies such as life cycle costing (LCC), sustainable procurement, value engineering, and assistance with green certifications. These strategies help to enhance material selection, reduce long-term operational and maintenance costs, and enhance overall project sustainability. However, significant challenges persist while they practice in the industry. The most significant barriers identified were client resistance and the complexity of implementation, followed by financial constraints, inadequate government policies, insufficient training, and limited availability of sustainable resources. These findings align with previous research highlighting institutional weaknesses and stakeholder resistance as major limitations in developing economies. The study concludes that QSs contribute significantly to evolving sustainability by performing as financial guardians, cost planners, and policy advocates. They also increase awareness among clients and stakeholders, thereby assisting broader adoption of sustainable practices. To maximize their impact, the research recommends establishing professional training, implementing sustainability into regulatory frameworks, and providing financial incentives to overcome upfront cost concerns. Ultimately, QSs embrace the potential to transition from traditional cost managers to sustainability leaders, ensuring that Sri Lanka's construction sector advances toward an environmentally responsible and socio-economically resilient future.

**Keywords:** *Green building practices, Quantity Surveyors, Life Cycle Costing, Challenges.*

# Impact of the Site Staff on the Success of the Project in Relation to Time and Budget

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**Abstract**

The construction sector is essential to economic growth, and it is still experiencing difficulties with cost overruns and delays in construction. The aspects of planning, technology, and financial management are frequently allocated to a greater proportion of the limelight. However, site personnel and their contribution towards the project success are a neglected aspect. This paper will discuss the presence of site personnel's performance on the successful completion of the construction projects within the budget. This research evaluated how site personnel efficiency affects project time and cost, using a mixed-methods approach with a survey of 72 construction professionals, including project managers, engineers, supervisors, QSs, and skilled laborers. The findings indicate that the efficiency of the staff has a significant correlation with project success. The speed of the decision-making process and supervisory assistance were the two factors that made the greatest impact on the results of the project. Besides these, the aspects of the timely and cost-effective project completion were also identified to be significantly contributory to the staff's education, attendance, and punctuality. The study discloses the fact that the site staff plays an essential role in the success of construction projects. It is based on the notion that it is not only the planning and distribution of resources that carry importance, but also the coordination of staff, level of skill, and level of staff management. These include the introduction of regular performance checks and reinforcement of the site staff by enabling them to make decisions, improved communication channels, as well as offering performance-based incentives to enhance accountability and motivation. Finally, this study provides the value of human factors at the site level in construction project management. It gives realistic details to project managers and contractors who seek to enhance site-level convenience and reduce delays and budgetary shortages. Focusing on optimizing the performance of the staff at the site, construction companies will achieve higher results and will make the construction business exponentially more valuable and profitable.

**Keywords:** *Construction Project Performance, Site Staff Efficiency, Supervisory Support, Decision-Making Speed, Time and Cost Overruns*

# A Study to Improve Ethical Behaviours of Quantity Surveyors in Colombo: Sri Lankan Building Construction Industry.

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**Abstract**

Improving the ethical behaviour of quantity surveying in the Sri Lankan building construction projects is very helpful to mitigate arising unnecessary issues, ambiguities, conflicts, and finally mitigate delays in construction projects to get the most prospective benefits to the parties of the construction project. This research will be focused on identifying the impacts of improving the ethical behaviour of BSc quantity surveying in the Sri Lankan building construction projects in Colombo, and the purpose of this study is to encourage the BSc quantity surveyors in the Sri Lankan building construction project in Colombo to follow Ethical behaviours while respecting the code of professional ethics relevant to quantity surveying. The research contributes to the literature by presenting a comprehensive analysis of the ethical challenges faced by BSc Quantity Surveying professionals in Sri Lanka, identifying the key factors influencing ethical behavior, and evaluating the effectiveness of interventions designed to enhance ethical decision-making. By focusing on the unique socio-cultural and regulatory environment of Colombo's building construction projects, this study offers nuanced insights into the complexities surrounding ethical behavior in this specific context. The researcher used a mixed-methods approach, collecting qualitative and quantitative data via a structured survey completed by 42 professionals in Colombo's building projects, analyzed using a relative importance index and manual content analysis. The research outcome has demonstrated that Sri Lanka is having less concern about the ethical behavior of BSc quantity surveying in the Sri Lankan building construction project in Colombo and the following is the key finding: Providing accurate and truthful cost assessments, conduct thorough reviews and checks to ensure all necessary documents are included before submission, professional ethics committees provide expert support and guidance on complex ethical issues, clients losing confidence in the services, leading to strained relationships and loss of future business. This, in fact, results in improving the ethical behaviors of BSc quantity surveying in the Sri Lankan building construction project in Colombo, Sri Lanka.

**Keywords:** *Sri Lanka, Ethical Behavior, Quantity Surveying, Building, Construction*

# The Role of QA/QC Practices to Reduce Rework and Enhance the Project Performance in Qatar's Road Construction Projects

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**Abstract**

Qatar's construction sector is under continuous pressure to deliver large-scale infrastructure projects on time and within budget, particularly in the expansion of its road network. One of the most persistent challenges undermining these efforts is rework, which results in significant cost overruns, schedule delays, and inefficient resource utilization. This research investigates the role of Quality Assurance (QA) and Quality Control (QC) practices in reducing rework in Qatar's road construction projects. The study is guided by three objectives: (i) to examine the extent and primary causes of rework in major road projects, (ii) to evaluate the effectiveness of existing QA/QC practices, and (iii) to propose strategies that enhance project performance while minimizing rework. The study uses a quantitative approach, combining a literature review, surveys, and case studies of Qatari road projects, with statistical analysis to examine how QA/QC measures reduce rework, costs, and delays. Preliminary results suggest that design inconsistencies, ineffective communication among stakeholders, and inadequate inspection and monitoring procedures primarily drive rework. However, projects that implement robust QA/QC practices—such as real-time monitoring, standardized testing protocols, and proactive defect management—demonstrate significant improvements in cost efficiency, schedule adherence, and overall construction quality. The study concludes that a structured QA/QC framework is critical in mitigating rework and achieving timely, cost-effective delivery of road projects in Qatar. It recommends that contractors and consultants strengthen compliance with Qatar Construction Specifications (QCS) by adopting integrated quality management systems, investing in digital technologies for real-time monitoring, and conducting continuous professional training. Additionally, improved collaboration between clients, consultants, and contractors is essential to ensure early detection and resolution of quality deviations. Overall, the research contributes both to academic knowledge and to practical industry guidance, offering actionable recommendations that support sustainable and efficient infrastructure development in Qatar.

**Keywords:** *QA/QC; Road Construction; Rework; Project Performance; Quality Audits*

# Cost-Effective Housing Solutions for Middle-Income Families in Sri Lanka

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**Abstract**

The purpose of this study is to propose a cost-effective housing design suitable for the middle-income population in Sri Lanka. By analyzing available documentation and statistical data, it has been identified that nearly 34% of the population, particularly within the middle-income group, lacks permanent housing. The research highlights that this demographic possesses sufficient financial strength to construct their own homes, provided they receive the necessary support and information. The study emphasizes the need for government intervention, not only through financial assistance but also by offering technical guidance and policy support to implement effective low-cost housing initiatives. The approach relies on utilizing sustainable and locally available construction materials and innovative design techniques to reduce overall project costs by up to 30%. Document analysis and comparative cost studies form the basis for evaluating construction methods, including the use of Compressed Stabilized Earth Blocks (CSEB), pre-stressed concrete beams, and Micro Concrete Roofing (MCR) tiles. The results suggest that middle-income families can feasibly build quality homes within their budget constraints when provided with a well-structured housing model and appropriate institutional support.

**Keywords:** *Low-cost housing, middle-income, Sri Lanka, housing technology, cost-effective materials*

# The Future of Quantity Surveying: AI-Powered Quantity Take-Off and Its Impact on Cost Estimation

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**Abstract**

Quantity Take-Off (QTO) is a core aspect of construction cost estimation, requiring expert judgement to interpret drawings and quantify materials. Although AI has the potential to improve speed, efficiency, and accuracy, its adoption in QTO remains limited. This study used semi-structured interviews with 50 quantity surveyors across Asia, Europe, and the Middle East to examine awareness of AI, perceived risks, data accuracy issues, impacts on professional roles, and ethical concerns. Findings show that AI can automate routine measurements and process large datasets, but its accuracy depends heavily on complete and consistent design information. Incomplete drawings, frequent revisions, and unclear specifications restrict AI's reliability without human oversight. Key risks include error amplification, reduced professional judgement, skill decline, and ethical accountability challenges. The study highlights the need for a hybrid approach that combines AI tools with human expertise, supported by strong data management, targeted training, pilot testing, and clear regulatory frameworks. Overall, the research provides insights into AI's role in QTO and guidance for its responsible and effective adoption in construction practice.

**Keywords:** *Quantity Take-Off (QTO), Artificial Intelligence (AI), Construction Cost Estimation, Data Accuracy, Professional Judgement, Ethical Challenges, Hybrid Approach, Quantity Surveying.*

# Risk Mitigation Through Arbitration in Contractual Disputes For Saudi Arabia's Residential Developments

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**Abstract**

The residential construction sector in Saudi Arabia is rapidly expanding under Vision 2030, which prioritizes affordable housing and large-scale urban development. However, the complexity and scale of these projects often lead to contractual disputes involving incomplete work, scope changes, payment issues, and delays. Traditional dispute resolution methods, particularly litigation, are costly, slow, and adversarial, making them unsuitable for residential projects that rely on stakeholder collaboration and timely delivery. Arbitration has emerged as a more flexible, confidential, and neutral alternative with enforceable outcomes. This study examines the effectiveness of arbitration as a risk-reduction strategy for contractual disputes in Saudi residential construction. A mixed-methods approach was adopted, using open-ended questionnaires distributed to developers, contractors, consultants, arbitrators, and policymakers. Quantitative data was analyzed using the Relative Importance Index to rank major dispute causes and assess arbitration's impact on project performance, while qualitative responses were analyzed thematically. Findings show that arbitration remains underutilized in residential projects despite its recognized potential to reduce risks and improve stakeholder satisfaction. Key barriers include cultural preference for litigation, limited awareness, perceived high costs, and insufficiently trained arbitrators. Enablers include the Saudi Centre for Commercial Arbitration (SCCA), the 2012 Saudi Arbitration Law, and strong governmental support for alternative dispute resolution under Vision 2030. The study concludes that arbitration can significantly enhance risk management in residential construction, but its success depends on greater awareness, stronger institutional support, improved contract standardization, and targeted training. The research contributes to construction law by offering practical, evidence-based recommendations to strengthen arbitration practices and support sustainable growth in Saudi Arabia's housing sector.

**Keywords:** *Contractual Disputes, Risk Mitigation, Residential Development, Saudi Arabia, Vision 2030, Construction Law*

# Utilizing BIM (Building Information Modeling) for Enhanced Cost Estimation Accuracy in UAE Mega Projects

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**Abstract**

Accurate cost estimation is a cornerstone of successful project delivery, particularly in the context of the UAE. Mega construction project scale complexity and stakeholders' diversity amplify financial risks. In order to overcome the drawbacks of conventional approaches that mostly rely on manual procedures and dispersed data sources, this study examines how Building Information Modelling (BIM) might increase the accuracy of cost estimation. The study combines quantitative examination of estimating reliability with qualitative perspectives from industry experts, such as quantity surveyors, BIM managers, and project stakeholders, using a sequential explanatory mixed-methods methodology. The results show that BIM greatly improves cost estimates in the Design Development, and Tendering stages. The most influential features were 3D modelling, automated quantity take-offs, and 5D cost integration. High implementation costs, a shortage of skilled workers, and the lack of common cost databases continue to limit the UAE's use of BIM despite its promise. The report finds important facilitators that might hasten BIM integration, including institutional training programs, client-driven requirements, and government regulations. By ranking critical factors using the Relative Importance Index and synthesizing stakeholders' perspectives, the research offers comprehensive frameworks for leveraging BIM cost management. It comes to the conclusion that BIM is a strategic instrument to improve financial management, transparency, and teamwork in large-scale projects rather than just a technical advancement. The results complement the UAE's ambition for a digitally empowered construction industry by adding to both scholarly discussion and useful implementation tactics.

**Keywords:** *Project Controls, Sustainable Project Management, Solar Energy Infrastructure, GCC, Risk Management*

# Sustainability and Project controls: Managing risks in Solar Energy Infrastructure Development in GCC (Gulf Cooperation Council) Countries

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**Abstract**

This research examines integrating sustainability into project control strategies to enhance risk management for large-scale solar energy projects in GCC countries. Despite the region's renewable energy potential, existing project controls often overlook the complex operational and environmental risks posed by the arid climate. Based on an empirical professional survey, this study identifies key risks, evaluates control systems, highlights gaps in sustainability measurement, and provides evidence-based recommendations for more effective sustainable project management. The risks which raised the most concern were Equipment Failures and Solar Panel Performance Degradation (RII of 0.78) which vividly outlined the industry's overwhelming concern on operational longevity and resilience, in lucid contrast to the risk of surplus on construction cost. This exemplifies a significant gap in the management of operational risks. The integration of control mechanisms which focus on the short-term strategies of Earned Value Management (EVM) and Critical Path Management (CPM) sheds light on a deeper misalignment in the control structures and operational risk management. The research showed the positive ramifications of the strategies towards sustainability. Specifically, the indicators Cost-Effectiveness (RII 0.99) and Resource Efficiency (RII 0.98) were the primary contributors, while controlling certain aspects of water maintenance was necessary to mitigate some of the risks. Nevertheless, the effectiveness of these strategies was limited due to the high initial costs paradox (RII 0.98) and training balances (RII 0.96) that were deemed insufficient. To mitigate these constraints, the study advocated the adoption of Sustainable Earned Value Management (SEVM) and the use of AI-empowered Digital Twins for predictive control as immediate focus areas to address the replacement of integrated control and management. This provided significant, business-validated guidance on control and management that effectively reframed project control as a tactful lever for the sustainable and resilient provision of solar infrastructure throughout the Gulf Cooperation Council (GCC) countries.

**Keywords:** *Building Information Modelling (BIM), Cost Estimation Accuracy, Automated Quantity Take-off, Construction Industry, UAE*

# Adapting the Algorithm: Evaluating Personalized Learning Technologies Across Cultures

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**Abstract**

Global education systems are increasingly adopting personalised learning technologies (PLTs); however, there is limited understanding of how effectively these systems operate across different cultural contexts. This study investigates how PLTs adapt to varied educational cultures, with an emphasis on learners' cognitive engagement, technological accessibility, and pedagogical alignment. Using a mixed-methods approach, the research analyses adaptive learning platforms implemented in Japan, Finland, and Sri Lanka. Data was collected from 150 students and educators through surveys and semi-structured interviews, complemented by a comparative analysis of platform algorithms and localisation techniques. Preliminary findings reveal that while PLTs significantly enhance individual learning outcomes, cultural disparities in interface design, learning pace, and instructional autonomy reduce their overall effectiveness. For instance, the autonomy-oriented learning style embedded in Western-developed PLTs often conflicts with Sri Lanka's collectivist and teacher-centred learning traditions. The study addresses this research gap by demonstrating that culturally sensitive, modular AI design improves inclusivity and engagement. It concludes that culturally adaptive algorithmic frameworks are essential for promoting equity and global relevance in personalised learning. By highlighting how algorithmic flexibility can bridge pedagogical divides, this research contributes to the broader discourse on digital equity, educational technology, and culturally responsive innovation.

**Keywords:** *Personalized learning, educational technology, cross-cultural education, adaptive algorithms, digital equity*

# Review of AI-Powered Booking Platform with Image Upload and Chatbot for Technical Services

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## Abstract

This study proposes an innovative AI-powered booking platform that integrates image recognition and a conversational chatbot to automate and streamline technical service management in Sri Lanka. The platform's primary innovation lies in the synergistic application of computer vision and natural language processing (NLP) to bridge persistent communication gaps between customers and technicians' issues that have long constrained efficiency in existing manual and semi-digital service systems. Unlike traditional approaches, the proposed solution facilitates accurate pre-visual problem assessment by enabling users to upload images of faulty components and receive guided diagnostic prompts through an intelligent conversational interface. The system is being developed using the robust Django framework to ensure scalability, reliability, and data security. Its architecture incorporates key functionalities such as GPS integration for optimized technician dispatch based on real-time proximity, and a cloud-based Firebase backend that supports live tracking of service requests from initiation to completion. This configuration enhances transparency, accountability, and coordination among all stakeholders by providing real-time visibility into the progress of ongoing tasks. A pilot study involving 30 participants comprising both customers and service providers was conducted to evaluate system performance and user experience. The results demonstrated high acceptance and operational efficiency: 87% of users found the image upload feature effective for fault identification, while 82% expressed satisfaction with the chatbot's clarity, responsiveness, and usefulness. Quantitative findings confirmed that the system significantly reduced administrative inefficiencies, eliminated double bookings, and shortened the average service scheduling time. The main limitation identified was the dependency on stable internet connectivity, which affected real-time responsiveness in certain cases. Nonetheless, participants praised the system's practicality, intuitive interface, and direct contribution to faster fault resolution and improved workflow management. Overall, the findings confirm that this integrated AI-driven solution enhances operational efficiency, service transparency, and customer satisfaction in technical service delivery. Future work will focus on incorporating secure online payment gateways, multilingual chatbot functionality, and advanced cloud scalability to enable nationwide implementation and ensure the long-term sustainability of intelligent service ecosystems.

**Keywords:** *Artificial Intelligence, Service Automation, Computer Vision, Chatbots, Intelligent Booking Systems, Technical Services*

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