



## **16<sup>th</sup> INTERNATIONAL RESEARCH CONFERENCE**

**ACHIEVING RESILIENCE THROUGH DIGITALIZATION, SUSTAINABILITY AND  
SECTORAL TRANSFORMATION**

**COMPUTING**

# **ABSTRACTS**



General Sir John Kotelawala Defence University  
Ratmalana, Sri Lanka.

## KDU PRESS

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# **ORAL PRESENTATIONS**

## Real-Time Server Room Monitoring System Using Internet of Things Technology

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### Abstract

The escalating expansion of server rooms and data centers underscores the urgency of ensuring their optimal performance and safeguarding. In this study, we propose a novel Internet of Things (IoT)-based server room monitoring system that leverages microcontrollers and sensors for continuous tracking of critical environmental parameters. This encompassing approach encompasses temperature, humidity, and power status, as well as early identification of potential threats such as vibrations, fires, and smoke. The core of our system integrates the versatile NodeMCU microcontroller, seamlessly interfacing with diverse sensors such as Smoke, Flame, AC Voltage, Temperature and Humidity, and Vibration sensors. Immediate notifications are facilitated through a combination of LED indicators and an audible buzzer, promptly alerting stakeholders when any monitored metric surpasses its pre-established threshold. Our solution extends accessibility through both mobile and web applications, affording user registration and streamlined access to pertinent real-time information. By enabling continuous monitoring and swift notifications, our system significantly bolsters the dependability and security of server rooms, empowering proactive maintenance and timely mitigation of potential anomalies. This research contributes a valuable IoT-centered innovation to server room monitoring, adeptly addressing the burgeoning demand for resilient and efficient monitoring mechanisms in tandem with the surging data requisites.

**Keywords:** *Internet of Things, Server Room, Arduino, Syncfusion Flutter, Google IoT Cloud*

## Applications of Wireless Sensor Networks and Object Detection in Precision Agriculture: A Review

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### Abstract

Sri Lanka is a nation with a strong history of crop farming. For the vast majority of people back then, agriculture was the only profession accessible. The cultivation is declining because of economic problems. By automating the agricultural process, a country's Gross Domestic Product and its residents' lifestyles will grow. The goal of this research is to learn more about the Wireless Sensor Network (WSN) based systems that have already been created and to pinpoint the best technology and sensors for a WSN that will be created to support big farms in Sri Lanka. Wireless sensor networks in agriculture and other technologies utilized in agriculture as well as for object recognition were the two primary areas of focus of this study. This study comprises a systematic literature review which is conducted by reviewing the most important set of research papers after identifying 100 research activities related to the discussed field. Further, in this study, the proposed design for the system is also discussed. The ZigBee protocol, which is the most modern and most readily scalable protocol among the ones that are now available, was used in the development of the majority of WSNs. Sensors were employed to measure humidity, temperature, and light. Additionally, some systems had an inbuilt expert system to give farmers professional advice on crop cultivation. To take pictures of the field, cameras were placed in the sensor nodes. The Atmega128L, coupled with the ZigBee protocol and various sensors, is the controller of the node that this article finds to be the most appropriate. The most effective algorithm for object identification and categorization is DTE.

**Keywords:** *Wireless Sensor Network, Precision Agriculture, Image Processing*

## A Deep Learning-based Approach for Detecting Dust on Solar Panels

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### Abstract

Solar energy has emerged as a crucial alternative to conventional power sources, but the accumulation of dust particles on solar panels poses a significant challenge to their efficiency. Frequent cleaning of the panels is also essential to optimize photovoltaic generation, but manual cleaning in these areas is challenging. Research indicates that if solar panels are left uncleaned for six months, they can have adverse effects. The dirt can lead to a 35-40% drop in power generation. The ability to detect dust is critical to ensuring that panels are clean. We propose a novel approach for dust detection on solar panels to address this issue, utilizing deep learning techniques. This research paper presents a comprehensive investigation into developing and implementing a deep learning-based model to identify and classify dust particles on solar panels automatically. The proposed methodology uses a Convolutional Neural Network (CNN) architecture, showing remarkable success in various computer vision tasks. The critical stages of this approach include data acquisition, pre-processing, and model training-collected dataset. This model has three main classes: dust >50%, dust, and clean. Improved accuracy of CNN model using data augmentation, preprocessing, deep learning, cross-validation, hyperparameter optimization, and performance metrics like precision, recall, and F1 score. The project aim is to develop an automated dust detection system for solar panels to improve accuracy, enable real-time monitoring, reduce maintenance costs, evaluate environmental impact, analyze long-term performance, ensure adaptability, provide a user-friendly interface, and assess cost-effectiveness.

**Keywords:** *Dust detection, Solar panels, Deep learning, Convolutional Neural Network*

## Robotic Marionette Puppet Controller with Shadow Effect

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### Abstract

Puppetry is an ancient entertainment method used by people to release their stress and represent stories. The puppet figure may be an object that resembles a person, an animal, or a mythical character controlled by a human using external help like rods or strings. The human who controls the puppet is known as the puppeteer. There are various types of puppets namely, marionettes, hand puppets, rod puppets, shadow puppets, and finger puppets. With the advancement of technology, the popularity of the art of puppetry has decreased with time due to many reasons. The main reason is the lack of new puppeteers to continue puppetry and puppeteers get lower earnings, so new puppeteers do not motivate to continue the puppet industry. Another reason is that with the advancement in technology, people have lost interest in traditional entertainment methods like puppetry, because of the increase in new entertainment methods like TV and mobile phones. After several studies, we decided that marionettes are the most suited type of puppet to develop an automatic puppet theatre base on robot technology. According to the data we collected, there are four automatic systems, and they all use different mechanisms to control the puppet including quadrotors, motion capture data, and automatic stage management technologies. This comparative research is conducted to study the existing systems and robotic technologies to identify the most suited requirements and mechanisms for a robotic-based automatic puppet system and design the most effective automatic puppet controller based on the information found. Finally, we hope this research will be helpful to protect the art of puppetry to stay alive for a longer period in Sri Lanka and other countries as well.

**Keywords:** *Rukada, Marionette puppets, Puppetry*

## A Mobile Application Featuring Advances in Immersive Augmented Reality Interventions to Support Depression Patients

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### Abstract

Depression is a global mental health concern that affects millions of people worldwide. Traditional treatment methods, though effective, may encounter obstacles such as stigma and limited resources. In response, mobile mental health apps have gained popularity due to their convenience, accessibility, and potential for personalized care. Advances in Immersive Augmented Reality (AR) have shown the potential in supporting interventions for depression patients. By leveraging the capabilities of AR, these interventions aim to enhance traditional treatments and provide accessible support to a wider population of patients. This paper introduces “ConnectWell”, a high-end mobile app that harnesses the power of AR to revolutionize depression management. ConnectWell transcends conventional app functionalities by seamlessly integrating AR-based patient-therapist communication, guided meditation, group therapy sessions, skill-building exercises, and coping strategies. A state-of-the-art AI-powered chatbot augments the app’s capabilities, offering continuous personalized support, guidance, and resource sharing. Additionally, the app is thoughtfully integrated with compatible smartwatches to monitor users’ physiological data, enabling real-time mood assessment and tailored interventions. The app serves as a supportive and compassionate virtual friend, providing positive responses and guidance whenever depression patients need someone to talk to and seek help. Utilizing the full potential of these mobile applications for supporting depression patients necessitates a thorough investigation into the adoption and dissemination of AR in conventional clinical practice. The paper concludes with a call for further research and development to investigate the feasibility and benefits of haptic-enhanced AR in mental health interventions.

**Keywords:** *Mobile application, Immersive augmented reality, AR-based interventions, Depression, Real-time monitoring*

## A Review on Wireless Sensor Networks and Object Detection Methods in Military Applications

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### Abstract

Object detection and tracking is a very useful technique in today's world when it comes to military activities as well as daily activities. If a battlefield is considered, there are places that are inaccessible to humans. In such instances, it is easy to monitor the location remotely. Also, using an automated monitoring system reduces the life risk of the soldiers deployed in the specific location. This review study is conducted with the aim of identifying the most suitable technologies and sensors to be used in the wireless sensor network along with the image processing and machine learning techniques available for object detection. This review study is carried out under two main topics as, wireless sensor network-based military applications and object tracking and detection. The systematic literature review was conducted to identify the most appropriate set of research papers. Then the selected papers were reviewed, and the most important facts needed to identify the solution were identified. The network topology of the systems is ad-hoc topology. ATmega182L and ATmega 2560 are the mainly used type of microcontrollers for the previously developed systems. PIR sensor and CMOS camera module are the mostly used equipment for the process of acquiring images. Image processing techniques are used for object detection and classification purpose. This review paper concludes that the best type of microcontroller is ATmega, CMOS LM9628 to use as an image sensor and the protocol for the WSN can be ZigBee.

**Keywords:** *Image processing, Military, Unmanned air vehicle, Wireless Sensor Network*

## Investigating User Interaction in User Interface Designs of Educational Websites for 7-8-Year-Old Children: A Comparative Study

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### Abstract

Focusing on User Interface (UI) design for websites targeted at 7-8-year-old students is essential to providing them with a positive, engaging, and educational online experience. Thoughtful design can make learning more accessible, fun, and effective for this young audience. This research delves into the attraction and user interaction of 7-8-year-old children with existing UI designs of educational websites. The study centres around three local websites, aiming to scrutinize children's design preferences. A sample group of 5 boys and 5 girls were selected from local schools. The collection of qualitative data was accomplished through structured interviews employing questionnaires, while the use of audio-visual recordings ensured meticulous and accurate documentation of the gathered information. 979 feedbacks were possible to gather using a survey. The findings indicate that children exhibit a preference for creative websites. The comparative analysis revealed distinct levels of user interaction across the studied websites. One website demonstrated the highest level of engagement, while another exhibited a less favourable performance in this regard. A third website fell in between, with a moderate level of user interaction observed. In conclusion, these findings emphasize the pivotal role of user preferences and interaction in the design of educational websites tailored for young learners. This highlights the responsibility of UI designers to adhere to appropriate design standards when developing websites for young children. The research assessed various aspects of the selected websites, including user interaction, fonts, colour, user behaviour, and gestures.

**Keywords:** *User Interface design, User interaction, Educational websites*

## Disease Detection in Coffee Plants Using Computer Vision

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### Abstract

Coffee is one of the most widely consumed beverages and an essential crop for many economies. Numerous diseases affect coffee plants, causing significant crop loss. The detection of plant diseases is done only through naked-eye observation and the farmers used to consult the experts, which is time-consuming. For crop losses to be kept to a minimum, early detection of these diseases is essential. This research suggests a technique that makes use of Convolutional Neural Networks (CNN). The suggested method entails gathering a dataset of coffee plants, pre-processing the images to improve the quality of the images, and training a CNN model. CNN develops the ability to automatically recognize patterns. After training, the model can identify diseases. Our goal is to develop a mobile application that can identify diseases in coffee plants. This app will provide farmers with timely and accurate details about diseases. The objectives of this study include training a CNN model and comparing its performance to existing approaches. Demonstrate CNN's ability to overcome the limitations of existing approaches through experimentation and validation and provide better accuracy and efficiency in disease detection across a variety of coffee plants. Our proposed model with CNN three-layer classifier with a 0.01 learning rate achieved an overall classification accuracy of 0.89% with the 28<sup>th</sup> iteration of the training process out of a total of 100 planned epochs. This research utilizes the capability of CNNs to construct automated systems for identifying coffee plant diseases, ultimately assisting in sustainable coffee production, and securing the livelihoods of coffee producers.

**Keywords:** *Convolutional Neural Network, Coffee leaf disease detection, Artificial Intelligence*

## **Design of a Study Table for Computing Undergraduates Using Kansei Engineering**

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### **Abstract**

In the present, product designs are more complicated when compared to past designs. It is important that the design of the items be attractive and comfortable to use. The study table of computer undergraduates differs from that of other undergraduates. In general, it is used to store books and arrange study materials effectively, and it should be designed in such a manner that students are encouraged to study. However, for computing students, not only books but also devices should be placed on the study table so they can easily handle them. After analyzing these facts, the authors decided to develop a table that would be convenient for the students. The main aim of this study is to design a study table using Kansei Engineering. The result of the research is based on the questionnaire, and fifteen Kansei words have been chosen. And the final design is created by considering those words and using the statistical analysis of the questionnaire. According to the analysis, the authors have designed an L- shaped, medium-sized study table. And it consists of monitor boards, an adjustable laptop holder, a headphone holder, sliding shelves, etc. Engineer wood is used as the material as it is durable, eco-friendly, cost-effective, and water-resistant. Furthermore, steel is used for the legs of the table, which are adjustable. That makes it more comfortable for the users.

**Keywords:** *Kansei Engineering, Study table, User-centered design*

## Design and Development of Vision-Based Uneven Surface Detection Mechanism of Low Computational Complexity for Walk-Assisting System for Blind People

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### Abstract

There are plenty of blind people who blind since birth or blinded by accident. Usually, they face a lot of problems while walking because most of the surfaces are uneven surfaces such as road bumps, and potholes. The goal of this study is to find a vision-based method for helping blind people to detect uneven surfaces. To identify uneven surfaces, colour differences, shadows of the uneven surfaces, and the techniques such as contour length, contour area, and nonzero pixel ratio of an image are being used. The image is initially captured and cropped to match the viewing angle of a human. Hue, Saturation, and Value (HSV) filter is applied to the cropped image along with thresholding techniques for classifying the image components such as road, grass, or concrete. Further the HSV thresholds aid in obtaining more detailed information from the image. Subsequently, the image is divided into eight parts, and the nonzero pixel ratio, contour area, and contour lengths are computed for each part. The resulting data is stored in separate arrays, and maximum values are determined. If the maximum values from two arrays share the same indexes, it suggests the presence of an uneven surface. To test the effectiveness of the method, the test images of various surfaces were captured and tested. From the test results, we found that the proposed algorithm can identify uneven surfaces. The findings of this study contribute to improving the mobility of visually impaired individuals by assisting them in navigating uneven surfaces more effectively.

**Keywords:** *Uneven surface, HSV filter, Contour detection, Low computational complexity*

## Fuzzy Logic-based Visual Impairment Level Identification System for Pre-schoolers and Toddlers

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### Abstract

Nearsightedness, or myopia, and colorblindness, the two common eye diseases, can affect preschoolers and toddlers. This research is to provide parents with a method for testing the two eye impairments listed above in children who are illiterate in both letters and numbers. Using the knowledge offered by ophthalmologists, comments from parents with young children of survey findings, and pertinent literature, this is to create a mobile gaming application based on Fuzzy Logic, that could evaluate the level of children's Colorblindness and Nearsightedness. The "Ishihara test" and "Hue test," which are still widely used today, can be used to identify color blindness by selecting hues from a color palette that have a similar color intensity, and by allowing children to choose images that range in size from large to small (follow the Snellen Chart), and Preferential Looking Test concept that parents can determine whether their child has nearsightedness based on the child's outward behavior. This mobile gaming application roughly identifies the level of the above two eye defects in young children and refers to medical advice if there is a certain risk level.

**Keywords:** *Colorblindness, Fuzzy Logic, Mobile gaming application, Nearsightedness*

## **Integrated Model for Identifying the Learning Style of the Students using Machine Learning Techniques: An Approach of Felder Silverman Learning Style Model**

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### **Abstract**

Identifying students' learning behaviours in learning environments is an essential factor in the success of the lifelong learning process. The intention of the research is to propose a methodology for identifying the learning style of the students in the online learning environment using machine learning techniques. The Felder Silverman learning style model (FSLSM) was used as the learning style identification model, and Moodle was used as the online learning platform. Data was collected for two modules each module consisting of 150 students who are following a BSc, Information Technology Degree at General Sir John Kotelawala Defence University. Once the students enrolled in the courses, their behaviours in the online learning environment were traced using Moodle logs and the time spent on each activity according to the FSLSM and applied machine. Then the machine learning classification techniques such as Decision Tree, Logistic Regression, Random Forest, Support Vector Machine, and K-Nearest Neighbors were applied to train the several models covering each main four dimensions of the FSLSM. The results show that each dimension of the FSLSM Decision Tree Classifier performed well with an accuracy of 95% for Input, 80% for Perception, 90% for Processing, and 95% for Understanding dimensions. The models were evaluated using k-fold cross-validation and Grid search methods and Hyper Parameter Tuning was done accordingly. Moreover, the validity of the models was evaluated by considering the Mean Squared Error, BIAS, and the values of the variance.

**Keywords:** *Machine learning, Felder Silverman learning style model, Learning style*

## Interactive Spelling Application for Preschoolers: A Journey Towards Playful Language Exploration

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### Abstract

In the realm of early childhood education, fostering effective spelling skills can be a challenge for both parents and teachers. Traditional methods often fall short of captivating pre-schoolers, hindering their engagement. Addressing this, this research endeavours to create an Augmented Reality (AR) spelling application, presenting an innovative solution to enhance the educational experience. This research introduces AR technology as a means to craft interactive and immersive learning environments, specifically aimed at boosting children's recognition and recall of individual letters within words. The core objectives encompass the identification of obstacles impeding language acquisition in early education and the development of a mobile app leveraging augmented reality to elevate spelling prowess. The research participants, comprising parents and preschool teachers from Sri Lanka, contribute through surveys and interviews. Children are taken on an immersive educational journey through the application, which begins with a gameplay mode where they can choose an animal. Once the AR mode is activated, virtual images of animals and floating 3D letters corresponding to their names are displayed. For example, the word "CAT" would be accompanied by a virtual CAT on the floor and 3D letters "C", "A" and "T" floating in the air. Using accompanying pronunciation sounds, children learn the proper letter placement and how to tap on the letters in the correct order. Feedback is given right away and shows how accurate the chosen letters were. This application integrates with the help of ARCore to showcase virtual 3D objects and the 3D letters forming the target word. To enable letter recognition, Convolutional Neural Networks are harnessed within the AR environment. A pre-trained Recurrent Neural Network model predicts letter pronunciation based on user interaction with the 3D letters. Ultimately, this research illuminates the potential of augmented reality to revolutionize childhood education. By offering a pragmatic avenue to enhance language and spelling learning, augmented reality technology can bridge the gap between conventional methodologies and engaging, effective pedagogy.

**Keywords:** *Augmented reality, Childhood education, Mobile application*

## Enhancing Crop Quality of Paddy Using Object Detection Techniques

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### Abstract

Crop diseases significantly impact paddy crop quality during harvesting, leading to approximately 40% average loss in rice crops, according to IRRI's Rice Knowledge Bank. Early detection of diseases is crucial for effective crop management and high yields, especially during the vegetative phase when susceptibility is high. The researchers suggest a way to early identify the diseases using image-processing algorithms. An initial image dataset is gathered according to an order either row-wise or column-wise. Then the gathered dataset is labelled and categorized into 4 groups: Yellow Blight, Tungro, Brown Spot, and Normal crops, and applied as the input for the YOLO V8 object detection algorithm. The system allows users to input a captured image, which will display the percentages of each disease's existence on the plot of land. The research culminates in a web application with an interface showing the field as a rectangle divided into sub-plots based on row and column coordinates. This interface facilitates convenient monitoring of disease outbreaks within selected plots. The YOLO V8 algorithm successfully detected visually imperceptible diseases on leaf blades in most images, even at the micro level. It performed well with multi-scaled images, but researchers aim to enhance precision and recall by adjusting the architecture and parameters. However, variations in lighting conditions, image quality, and occlusions can impact its performance. The dataset used in the study focused on a limited number of common diseases, necessitating further research to apply it to a broader range of diseases in paddy cultivation.

**Keywords:** *Paddy disease, YOLO V8, Crop quality*

## Deep Learning based Approach for Obstructive Sleep Apnea Detection Using EEG Signals

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### Abstract

In Obstructive Sleep Apnea (OSA), the most prevalent type, is characterized by abnormal breathing patterns or intervals of difficulty breathing while sleeping. The most frequent ailment is OSA. All ages are affected; however, older persons are the most typically impacted. The regular sleep cycle is dramatically altered by OSA, which results in numerous heart-related problems. The traditional way of diagnosing sleep problems is polysomnography, although, over the past few decades, various alternatives have been offered to replace traditional approaches due to their complexity and time commitment. This study proposes a deep learning-based obstructive sleep apnea detection system that uses the power of convolutional neural networks, artificial neural networks, and logistic regression algorithms to detect sleep apnea patterns from electroencephalogram (EEG) signals. The hybrid classifier technique used by the system successfully recovers spatial and temporal information from EEG data, increasing the precision and efficacy of sleep apnea detection. The study's methodology involves data collection, preprocessing, feature extraction, and model training using a labelled dataset of EEG signals from patients with obstructive sleep apnea. The deep learning-based classifier's performance is assessed using a different test dataset to determine accuracy, sensitivity, specificity, and area under the curve. The results show that the suggested method surpasses existing state-of-the-art techniques in identifying sleep apnea, giving a more accurate and efficient diagnosis. However, the system's dependability is strongly dependent on the correctness and completeness of EEG data, and more validation with varied datasets is required to establish its generalization abilities.

**Keywords:** *Obstructive sleep apnea, Electroencephalogram, Electrocardiogram, Deep learning*

## Development of a Web Application for Asthmatic Wheeze Detection Using Convolutional Neural Networks

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### Abstract

Asthma and Chronic Obstructive Pulmonary Diseases are two lung conditions that frequently exhibit breathing problems. If you have asthma, your airways may become more constricted, enlarged, and mucus-producing. This could block your airways and result in wheezing, whining, coughing, and shortness of breath. As a result, wheezing can be a vital diagnostic tool for determining the presence of many disorders. An individual's respiratory rate increases when they wheeze, and as a result, their lungs are more likely to work harder than they normally would, and it will pose a significant health challenge and can lead to severe complications if not detected and managed early. In this research, we present a web application for asthmatic wheeze detection using Convolutional Neural Networks (CNNs) for the early identification of respiratory disorders in Sri Lanka. The system leverages a web application server to receive audio recordings from an electronic stethoscope and applies a CNN model to analyse the data and detect wheeze. Additionally, the system provides therapy recommendations and dosage prescriptions based on the detected respiratory disorder. The developed model achieves an accuracy of 74.68% in wheeze detection. This research aims to improve respiratory health monitoring in Sri Lanka and provide healthcare professionals with a reliable tool for early intervention.

**Keywords:** *Chronic Obstructive Pulmonary Diseases, Asthma, Wheezing, Convolutional Neural Network*

## A Gated Recurrent Unit Neural Network-based Predictive Maintenance Approach for Machinery Maintenance in the Apparel Industry

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### Abstract

The Sri Lankan garment industry has been garnering attention by bringing the country a huge income over the past years. The role of well-functioning machinery is a crucial factor in producing flawless products in this industry. Hence it is a must for machinery equipment to work regularly thereby providing the engineering crew a minimum hassle. Therefore this research paper presents a Predictive Maintenance based methodology designed with the aid of a type of deep learning model, a Gated Recurrent Unit Neural Network (GRU) to predict a machinery breakdown due to component failures. Machinery data were used to create data models which gave the component malfunctioning as a multiclass classification output. While researching, to handle the class imbalance problem, Synthetic Minority Oversampling Technique (SMOTE) mechanism was also used to obtain a balanced data distribution. Various combinations of basic deep learning models and models based on Recurrent Neural networks, GRU, and Long Short-Term Memory networks were used to train the data models, where the GRU-SMOTE model outperformed the other models that had an accuracy of 98.77% along with fine scores for macro average precision, macro average recall, and macro average f1-score. These early hand predictions can be therefore utilized to face sudden machinery failures that will allow the mechanical crews to plan and schedule maintenance work efficiently preventing the expenditure of unnecessary time and resource wastages.

**Keywords:** *Deep learning, Gated Recurrent Unit Networks, Multi-class classification, Predictive maintenance*

## Streamlining Emergency Ambulance Services with Fast API: A Location-based Approach for Efficient Healthcare Delivery

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### Abstract

In the face of escalating challenges in emergency healthcare services, achieving resilience has emerged as a critical objective. This research paper examines the potential of a location-based emergency ambulance booking system to bolster the resilience of 1990 Suwa Seriya in Sri Lanka. By embracing digitalization, sustainability, and sectoral transformation, this study addresses the urgent needs of the healthcare system. Through a comprehensive mixed-methods approach, including semi-structured interviews and a web-based survey, valuable insights are gathered from patients, hospitals, and healthcare service providers. These insights inform the development of “Ambu Finder”, an innovative solution utilizing advanced technologies. The system, built with the Python framework Fast API, incorporates a Rest API for location tracking, allowing users to swiftly request an ambulance during emergencies. Leveraging geolocation technology, Ambu Finder identifies nearby hospitals with available ambulance services, enabling prompt responses and reduced emergency response times. Additionally, the application, developed using React Native for the mobile platform, offers registered users the convenience of uploading their medical reports, ensuring hospitals are well-prepared to handle critical situations. This research sheds light on the transformative role of digitalization, sustainability, and sectoral transformation in enhancing resilience within emergency healthcare services. By emphasizing the integration of these three pillars and leveraging cutting-edge technologies such as cloud storage, the study underscores their pivotal significance in the successful implementation of the location-based emergency ambulance booking system. The findings provide crucial insights for healthcare stakeholders and offer recommendations for further research and practical implications, ultimately paving the way toward a more resilient healthcare system.

**Keywords:** *Location-based emergency ambulance booking system, Digitalization, Resilience*

## Challenges and Perspectives in Urban Flood Management Automation

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### Abstract

Automation or digital transformation has become essential in various disciplines and organizations, including urban flood management. Urban floods are recurring natural disasters that can be mitigated through engineering solutions, but their management involves stakeholders from model developers to decision-makers. Therefore, automating urban hydrological models presents challenges related to data integration, interdisciplinary requirements, and the usability of tools for non-technical decision-makers. This research focuses on understanding the perspectives of computing professionals in urban flood management automation. A survey-based analysis was conducted using a questionnaire to understand the current practices and knowledge areas relevant to multi-model automation. The questionnaire was developed following a systematic methodology and validated through expert panels. The data collected from 44 computing professionals were analysed using the trapezoidal membership function of fuzzy logic to determine their perspectives on various aspects of automation. The study identified eight independent variables such as stakeholders' and developers' responsibilities, business rules, multi-model automation, calibration and verification of models, usability, security, multiple models in a single tool scenario, and automation frameworks. The findings provide insights into the gaps of unavailability of the HydroGIS tool development framework and satisfactory practices in urban flood management automation. The results urge to development of a suitable framework for HydroGIS tool automation and suitable guidelines and procedures for computing professionals in urban flood management projects.

**Keywords:** *Automation, Digital transformation, Software frameworks, HydroGIS tools*

## **A Review on the Impact of Online Banking on Customer Satisfaction: A Comparative Analysis of User Experience and Service Quality Factors in Online Banking**

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### **Abstract**

The study's objective was to examine the user experience and service quality aspects of online banking in the public and private sectors in the context of Sri Lanka's contemporary banking system. In the context of online banking, this can concentrate on the idea of transaction costs and how it affects customer satisfaction. The study can investigate how transaction costs, such as those associated with searching, negotiating, monitoring, and enforcing policies, impact customer satisfaction with online banking services offered by both public and private banks. The study can examine the effect of transaction costs on customer satisfaction in the digital banking environment by looking at the user experience and service quality elements unique to online banking. This would entail analysing the effects of elements like the simplicity of online banking transactions, the effectiveness of customer service in resolving online banking issues, the security measures put in place by banks, and the clarity of online banking policies on consumer satisfaction. Furthermore, the comparison research can determine whether transaction costs in the context of online banking vary between public and private banks. It can investigate whether specific transaction costs have a greater effect on customer satisfaction in one industry than another. Overall, the research can offer useful insights into Sri Lanka's banking industry by examining the effect of online banking on customer satisfaction and contrasting the user experience and service quality elements in online banking services provided by public and private banks. These insights can serve as a roadmap for the creation of efficient strategies that will increase customer satisfaction, reduce transaction costs, and enhance the overall functionality of online banking.

**Keywords:** *Online banking, Customer satisfaction, User experience, Customer service*

## **Enhancing University Education in Sri Lanka through Gamification: A Review on Student Engagement and Learning Perspective**

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### **Abstract**

Gamification has gained significant attention as an effective approach to engage and motivate students in various educational settings. This research focuses on exploring the application of gamification in Sri Lankan university education, considering its cultural and contextual nuances. The objective is to investigate the potential benefits and challenges of implementing gamification techniques in this context, by enhancing student engagement, motivation, and learning outcomes, gamification offers promising possibilities for improving the quality of education in Sri Lanka. This study aims to understand how gamification can be utilized to address educational challenges, personalize learning experiences, and enhance critical thinking and problem-solving skills among Sri Lankan university students. The research validated the literature findings from educators, students, and other stakeholders to ensure that the findings are contextually relevant and applicable. Ethical considerations, data privacy, and implementation challenges are also addressed. The results of this research will provide valuable insights into the effectiveness of gamification in Sri Lankan university education, ultimately contributing to the advancement of teaching and learning practices in the country.

**Keywords:** *Gamification, University education, Student engagement, Student motivation*

## Unchaining the Future of Software License Management in the Digital Age through Blockchain

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### Abstract

In the current digital age, software license management plays an essential role in assuring compliance, security, privacy, and optimal use of software resources. With the dawn of blockchain technology, there is a growing interest in exploiting its potential to transform software license management. This research study focuses on how blockchain technology, digital signing, and smart contracts can be used to redesign software license management. The Research investigates the unique contributions of blockchain technology in improving security, trust, and automation in software license administration, as well as software license challenges. It delves into the concept of digital signing, which offers a cryptographic technique for verifying the validity and integrity of license agreements, assuring non-repudiation, and prohibiting unauthorized modifications. Furthermore, this research looks into the potential of smart contracts in automating license verification, activation, and expiration processes based on established conditions, expediting administrative duties, and reducing human intervention. This research sheds light on their combined impact on software license management. It emphasizes the advantages of using blockchain for immutable record keeping, transparent audit trails, and improved license compliance. The study also covers the various obstacles and considerations in deploying these technologies, such as scalability and privacy. This research paper investigates the digital age's reformation of software license management, highlighting the transformational possibilities of blockchain, digital signing, and smart contracts.

**Keywords:** *Software license management, Blockchain, Digital signing, Smart contracts, Privacy*

## **POSTER PRESENTATIONS**

## The Impact of Agile Practices on Software Evolution in Startup Companies

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### Abstract

Over the past few decades, the software development industry has embraced agile approaches. Intending to create high-quality software solutions that satisfy customer expectations, these methods place a strong emphasis on iterative development, adaptability, and customer collaboration. This study examines how Agile practices have affected the development of software in Startup companies. The objective is to obtain a thorough knowledge of the impact of Agile on startup companies. The research was conducted using several approaches including a thorough examination of the literature, an interview with a software engineer, and a survey given to a group of software developers. The results imply that Agile techniques have an advantageous effect on software quality, project effectiveness, and client satisfaction. The study highlights the benefits of Agile implementation and addresses challenges during adoption. In order to promote software evolution and improve project results, startups are recommended to adopt Agile practices. Future studies in this field could examine the effects of particular Agile practices on the evolution of software in various organizational contexts as well as the elements that contribute to the effective adoption of Agile methodology. Overall, this study adds to our understanding of Agile methods and how they affect the evolution of software in Startup companies, serving as a useful tool for businesses looking to enhance their software development procedures.

**Keywords:** *Agile Practices, Software evolution, Software maintenance, Startups*

## **A Review of Developing a Web-based Application for Job Recommendation Using Selected Job Portals**

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### **Abstract**

The emergence of job portals on the Internet has made job-seeking easier and more accessible in the current job market. However, with the increasing number of job postings across various platforms, job seekers face difficulties when deciding the most suitable job portal that they can use to search for the best job opportunities. The fast growth of job portals has led to an enormous amount of job postings being posted on various job sites. Due to this reason, job seekers find it difficult to choose suitable job opportunities that align with their skills, preferences, and other requirements. This paper presents a solution to this problem through the development of a Web- Based Job Recommendation System that aggregates job postings from multiple job portals. A job Recommendation System has the ability to provide personalized recommendations based on an individual's skills, preferences, and other requirements. The proposed approach aims to simplify the job searching process, allowing job seekers to access a wide range of job postings in one platform. With this application, Job Seekers will get the opportunity to get tailored recommendations that satisfy them without much effort.

**Keywords:** *Job recommendation, Web scraping, Job portals, Job seeker*

## Identification of Related Technologies Associated with Asthmatic Wheeze Detection System: A Review

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### Abstract

Breathing difficulties are a common symptom of lung disorders such as Chronic Obstructive Pulmonary Diseases and asthma. Your airways may narrow, swell, and create additional mucus if you have asthma. This may obstruct your airways and cause shortness of breath, coughing, a whistling sound when you exhale, and wheezing. Therefore, wheezing can be used as a crucial diagnostic tool for the identification of various diseases. An individual's respiratory rate increases when they wheeze, and as a result, their lungs are more likely to work harder than they normally would. The presence of low blood oxygen levels, elevated heart rates, increased breathing sounds, increased breathing rates, and coughing can all be utilized to diagnose wheezing in a person. In this study, the aforementioned characteristics are used to identify wheezing in an asthmatic patient. Asthma, a widespread health condition affecting individuals of all ages, poses a significant risk as it claims the lives of many people daily, making it essential to raise awareness, research, and improve management strategies to reduce its impact on public health. With the proper treatment and care, almost all of these fatalities may be prevented. Therefore, this review study contains the study of such systems to determine what technologies can be best in developing this kind of system while considering the accuracy of the systems. After studying these technologies, authors have identified that Neural Networks can be used to develop this kind of system due to their high accuracy of it.

**Keywords:** *Chronic Obstructive Pulmonary Diseases, Asthma, Wheezing, Neural Networks*

## **Augmented Reality for Enhanced Performance in Footwear Shopping Applications: A Comparative Analysis**

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### **Abstract**

The Sri Lankan footwear sector has exhibited remarkable longevity, effectively catering to the local market. However, in contemporary times, the footwear industry grapples with challenges related to e-business models. The study delves into this issue, scrutinizing prevailing footwear-selling applications. Through a comprehensive approach, the researcher engaged in interviews with both footwear vendors and buyers, while also distributing questionnaires to gather insights. A significant hurdle encountered by consumers in the realm of online purchases pertains to identifying footwear products that align with their specific needs. The challenge lies in envisioning how the shoes will fit and feel when worn. Addressing this concern, the research identified augmented reality as a potential solution. Augmented reality involves blending real-world elements with virtual environments, offering a promising avenue for resolving this dilemma. The investigation encompassed ARCore, ARKit, and deep augmented reality for their capacity to visualize 3D models. Deep Augmented Reality (DeepAR), in particular, emerges as pivotal in mobile app development due to its robust features like plane and point detection, light estimation, 3D object tracking, background segmentation, and object placement. Accordingly, the researcher advocates for leveraging DeepAR technology to enhance footwear visualization. By implementing this approach, users can accurately perceive how the chosen footwear will appear in real time on their feet. This application facilitates a virtual preview of how the shoes would look and fit when worn, thereby bridging the gap between online shopping and physical experience. Ultimately, the proposed system not only enhances customer satisfaction but also holds the potential to augment the profitability of the current footwear industry. By providing unprecedented support and bridging the visualization gap, this innovative solution can significantly contribute to reshaping the trajectory of the industry.

**Keywords:** *Deep Augmented Reality, Footwear shopping, Virtual Shoe-Try-On*

## A Review of Methods Used for Health Prediction and Monitoring Utilizing Electronic Medical Records System

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### Abstract

With the global population steadily increasing, there is a growing demand for electronic medical records due to the substantial amount of information generated within hospitals. Handling these records physically can prove challenging. Electronic medical records (EMRs) have had a profound impact on the healthcare sector by digitizing hospital records, thereby enhancing patient care. By enabling electronic entry, maintenance, and storage of medical data over extended periods, EMRs contribute to improved patient care and safety. This review examines and compares various methods and techniques aimed at diagnosing and predicting diseases accurately through the use of EMRs. Additionally, it presents a comparative analysis of different approaches available for health prediction. Recent publications were studied to categorize these techniques into Deep Learning methods, Machine Learning methods, and Rule-Based methods. Moreover, the review outlines the advantages and disadvantages associated with these diverse techniques and discusses their impact on the healthcare industry.

**Keywords:** *Healthcare, Deep learning, Electronic Medical Records, Rule-based method, Disease diagnosis, Machine learning*

## Implementing an Intelligent Patient Care System Utilizing Machine Learning to Advance Healthcare Practices and Patient Outcomes

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### Abstract

This research paper introduces an Intelligent Patient Care System (IPCS) that aims to transform healthcare practices and improve patient outcomes. By utilizing machine learning, specifically the random forest algorithm, the IPCS strives to enhance diagnostic accuracy and treatment recommendations. The study explores the advantages and limitations of existing IPC systems and emphasizes the potential benefits of the proposed system. The IPCS facilitates informed decision-making by medical assistants and doctors through the identification of patterns and prediction of disease risks. The system streamlines communication and information flow among healthcare providers, ensuring a seamless workflow. Notable features include the ability to gather patient information from medical assistants, diagnose diseases, recommend tests, and provide comprehensive data snapshots to doctors. The research concludes that the IPCS has the potential to enhance patient satisfaction, reduce healthcare costs, and improve the overall quality of care by embracing data-driven insights and innovative solutions.

**Keywords:** *Intelligent Patient Care System, Machine learning, Diagnostic accuracy, Treatment recommendations, Healthcare industry*

## Home Garden-based Ayurvedic Plant Identification System Using Convolutional Neural Networks, A Review

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### Abstract

Ayurveda, one of the oldest medical systems in the world relies on natural ingredients from plants to treat various illnesses. Since Sri Lanka is blessed with abundant plant resources, there is a need to identify Ayurvedic herbs for medicinal purposes correctly. Unfortunately, many citizens, especially the younger generation, are unfamiliar with these valuable plants. Additionally, the country is facing an economic crisis, leading to shortages of imported medicines. To address these challenges, a system is proposed to identify Ayurvedic plants available in-home gardens, enabling the public to use them as remedies. While plant identification systems have been studied extensively, there is limited research on home garden-based Ayurvedic plants. This research aims to review existing plant identification systems, the technologies they employ, and their limitations. The study explores the feasibility of using Convolutional Neural Networks, the latest technology, for plant identification. By comparing the accuracy and efficiency of each method, the goal is to select the most suitable approach to implement a home garden-based Ayurvedic plant identification system.

**Keywords:** *Ayurvedic plant identification system, Convolutional Neural Networks, Machine learning, Feature extraction*

## **NUTRICARE : Optimizing Personalized Diet Recommendation through a Knowledge-based Approach**

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### **Abstract**

Noncommunicable disease prevalence, particularly obesity, is a major global health concern. A balanced diet can help with nutritional issues such as malnutrition and obesity. Individuals, on the other hand, frequently lack understanding about the proper nutrients and diets for their health and gaining access to healthcare specialists can be difficult. Diet recommendation solutions based on Artificial Intelligence algorithms have evolved to solve these challenges. These systems use big data and tailored criteria to deliver individualized diet recommendations. Existing approaches, however, have shortcomings, such as a lack of expert oversight and consideration of various individual characteristics. We propose a knowledge-based diet recommendation approach for Sri Lankan people between the age of 18-60 who do not have any special conditions. To give precise and safe diet recommendations, this approach considers data such as gender, Body Mass Index, pathology report results, food allergies, dietary preferences, and physical activity levels. The incorporation of expert supervision improves the effectiveness of this approach. This study contributes to the creation of a sophisticated and all-encompassing approach to tailored nutrition advice.

**Keywords:** *Personalized diet recommendation, Knowledge-based approach, Decision tree algorithm*

## Effective Identification and Cessation of Tobacco Consumption using Gesture Analysis – A Review

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### Abstract

Tobacco consumption continues to be a considerable issue in today's society. Apart from the obvious health problems that arise through consuming tobacco products, various social, cultural, and economic predicaments can also be linked to this matter. Thus, the need for tobacco cessation is now greater than ever. Tobacco cessation must begin with the proper identification of individuals who regularly consume tobacco products, separating them from people who are exposed to second-hand smoke. Unfortunately, current methods of identification have their own unique drawbacks, and they may not always align with the other procedures of the complete cessation model. Consequently, the need has arisen for a unified cessation model that takes proper identification into account as well. Gesture analysis, along with a points-based rewards system may be the key to solving this dilemma. This method of cessation will rely heavily on replacing the temporary satisfaction and gratification supplied by tobacco consumption, with a more tangible, rewarding, and wholesome form of gratification.

**Keywords:** *Abstinence, Carbon monoxide, Smoked tobacco, Smoking cessation, Tobacco use cessation*

## Artificial Cognition-based Medical Diagnosis and Treatment Recommendation System: A Review

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### Abstract

In the rapidly evolving world, technological advancements and innovations have led to increasingly complex mechanisms. This research paper presents the implementation of an artificial cognition-based medical diagnosis and treatment recommendation system. The aim of the study is to leverage technological advancements in natural language processing, wearable devices, and image analysis to create a sophisticated system capable of accurately and efficiently diagnosing diseases and suggesting appropriate medical treatments. The methodology draws inspiration from IBM's Watson model and integrates cognitive systems that closely simulate human-like functions within computers. By adopting this approach, complex medical problems can be addressed with improved accuracy and expedience. The results demonstrate the system's capability to deliver reliable diagnoses and corresponding treatment recommendations. Overall, this research showcases how cutting-edge technological solutions can revolutionize medical practices, paving the way for more effective patient care and management.

**Keywords:** *Artificial Intelligence, Cognitive systems, Recommendation systems, Healthcare*

## Predictive Models for Monetary Asset Price Evaluation: A Comparative Review

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### Abstract

This review focuses on analyzing and evaluating predictive techniques for asset price forecasting, centering attention on gold, real estate, and automobile markets. The paper explores numerous algorithms, techniques, methods, and models utilized in foreseeing the values of these assets. A thorough appraisal is conducted that presents various procedures for forecasting the value of assets. This exploration compares the pros, cons, and performance metrics of the anticipating models applied in each discipline. Remarkable attention is granted to the forecasting ability of Convolutional Neural Networks, Fuzzy Rule-based Systems, Deep Learning techniques, Ensemble Regression Models, and other Machine Learning algorithms. Moreover, the tasks of data analysis, preprocessing, and feature selection methods in boosting prediction accuracy are investigated. This review paper calls attention to the implications along with applications of error-free asset value forecasting, together with knowledge-based decision-making, risk mitigation in addition to investment strategies. Moreover, it examines the challenges and limitations along with future directions in the domain, highlighting the demand for robust, compliant, and interpretable forecasting models. By assessing and differentiating the approaches and outcomes of asset value prediction across contrasting fields, this review delivers important insights appropriate to researchers, professionals, and decision-makers concerned with the dynamics and predictive potentials of these platforms.

**Keywords:** *Monetary asset price evaluation, Gold price prediction, Real estate price prediction, Automobile price prediction*

## A Comprehensive Study on Software Evolution in Plan-driven and Agile Methodologies

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### Abstract

This research paper examines the evolution of software development approaches, focusing specifically on the comparison between agile and plan-driven methodologies. The paper provides an overview of the historical development of software development approaches, highlighting the shift towards more flexible and collaborative methods with the emergence of agile methodologies. The paper then explores the benefits and challenges of agile and plan-driven approaches, drawing on a range of case studies and empirical research. The research highlights the importance of effective project management, communication, and collaboration in facilitating the successful implementation of both agile and plan-driven methodologies. The paper also emphasizes the need to consider the specific needs and requirements of each software development project when deciding which approach to use. Overall, the research provides insights into the evolution of software development approaches and offers practical recommendations for project managers and software developers seeking to optimize their software development processes.

**Keywords:** *Agile Methodologies, Plan-driven, Software evolution*

## Reviewing the Performance of Data Classification Using Modern Convolutional Neural Network Architectures

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### Abstract

This research paper conducts a comprehensive review of the performance of data classification through the utilization of modern Convolutional Neural Network (CNN) architectures. Encompassing prominent designs such as GoogLeNet, MobileNet, VGG16, AlexNet, ResNet, and DenseNet, this study evaluates their effectiveness on established benchmark datasets. The analysis highlights ResNet's exceptional accuracy as a front-runner in deep and efficient architecture, while DenseNet displays competitive performance on CIFAR-10 and CIFAR100 with reduced parameters. This investigation underscores the adaptability of architectures to specific tasks, with ResNet excelling in intricate feature extraction tasks, and DenseNet optimizing parameter efficiency. The continuous exploration of novel CNN architectures persists, driven by the pursuit of heightened classification precision and the evolving landscape of datasets and computational capabilities, propelling the advancement of effective models across classification domains.

**Keywords:** *Convolutional Neural Network, Performance analysis, Deep learning*

## **Enterprise Resource Planning based Effective Automated Facility Management System for Local University Accommodation**

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### **Abstract**

The rapid development of technology is causing a revolution in organizational structure. Automated processes are the transformation of manual ones through technological concepts. It is creating an effective and efficient environment. The enterprise resource planning (ERP) concept is mainly focused on developing a solution to manage the overall process and resources in the organization very effectively. Consider local university accommodation facilitation and management based on a manual process. As a result of the research study's findings, those manual processes have identified failures such as time waste, paperwork, data security, less facility maintenance, and less interconnection with students and administration. Local University accommodations have an important daily maintenance process. Also, students have an interest in living in university housing. So, university accommodation management staff have the responsibility of managing the facilities and services offered to students and creating a comfortable resident environment for them. But practically, it may be very difficult to maintain and continue responsibilities. Some reasons include a lack of management staff, no official communication platform with students, and different academic schedules of students. This proposed system will allow the university to maintain and manage its accommodation facilities and services. Also, this web system is the official platform for students to interconnect with accommodation staff. ERP concepts develop an effective and efficient platform for automatically managing the overall process of local university accommodation.

**Keywords:** *Enterprise Resource Planning, University accommodation management system, Automated facility management*

## Conceptual Framework for a Blockchain-based Medication Supply Chain Tracking System: Enhancing Trust and Security

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### Abstract

The increasing prevalence of counterfeit drugs and the complexities of the drug supply chain have highlighted the need for innovative solutions to enhance traceability, transparency, and patient safety. This concept paper aims to explore the potential of implementing a blockchain-based drug supply chain tracking system as a transformative solution to address these challenges. Through existing literature, this paper analyzes the feasibility, benefits, and implications of leveraging blockchain technology in the pharmaceutical industry. The methodology includes framework development, data collection methods, data analysis techniques, and research design. The results reveal a high level of stakeholder awareness and positive perception of blockchain technology, along with identified challenges in the current drug supply chain. The discussion section examines the implications of the findings, including the potential benefits, and regulatory considerations. Furthermore, the paper identifies areas for further research, such as empirical validation, integration with emerging technologies, and exploration of social and economic impacts. The concept paper concludes by emphasizing the significance of Blockchain-based drug supply chain tracking systems in ensuring medication authenticity, improving patient safety, and fostering trust among stakeholders. This research serves as a foundation for future studies and development in the field, aiming to create a secure, transparent, and efficient pharmaceutical industry that prioritizes patient well-being.

**Keywords:** *Conceptual framework, Blockchain, Medication supply chain tracking system, Trust and security*

## The Potential of Blockchain-based Ridesharing System to Enhance Trust and Security: A Conceptual Framework

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### Abstract

Ridesharing has been a popular concept in the 21<sup>st</sup> century due to the rapid growth of technology. However, due to its centralized architecture, it suffers from transparency, safety, and data privacy issues. This conceptual research paper aims to explore the potential solution for enhancing the trust and security of traditional ridesharing systems through the implementation of a blockchain-based decentralized ridesharing system and a reputation management system. The research methodology consisted of a systematic review of existing literature to gather insights and theoretical underpinnings and also a questionnaire to collect empirical data from the current ridesharing users. The systematic review provided theoretical support for the proposed system, and the questionnaire responses shed light on user preferences and concerns, highlighting the significance of transparency and security in the ridesharing experience. This paper contributes insights into the design, implementation, and evaluation of a blockchain-based ridesharing system that prioritizes user trust, security, and privacy, enhancing the understanding and application of blockchain technology in the ridesharing domain.

**Keywords:** *Blockchain technology, Decentralized governance, Ridesharing system, Smart contracts, Conceptual framework*

## Drone-based Internet of Things for Smart Agriculture: A Review

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### Abstract

Agriculture is vital for human survival. In the modern world, there is an ever-increasing need for food with the increasing population. Hence, farmers are determined to have successful harvests in order to meet the market demand and make high profits as well. But this is difficult to achieve with traditional farming methods such as spreading seeds by hand and checking each and every plant for their health. Not only is it hard to do but it takes up a lot of time. The Internet of Things is in high demand nowadays. By utilizing technology in agricultural practices, we can get more work done in lesser time. Even though most farmers around the world use some type of machinery like tractors and sprinkler systems, drone technology is still new to the field. This paper reviews several types of drone technologies available for efficient and productive agriculture by using drones for tasks such as soil quality evaluation, spreading of seeds, monitoring crops, identifying pests, and even evaluating the ripeness of fruits. This review showcases how drone technology offers a viable solution for addressing various challenges in the agricultural sector, challenges that manual labor and conventional machinery such as tractors are unable to tackle.

**Keywords:** *Agricultural drone, Internet of Things, Spraying pesticides*

## A Review on Leveraging Technology for Enhanced Pregnancy Care

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### Abstract

Technological advancements have the potential to revolutionise prenatal care, improving outcomes for expectant mothers and their unborn children. This comprehensive review explores the efficacy, challenges, and potential benefits of integrating User Experience/ User Interface (UX/UI), Natural Language Processing (NLP), Machine Learning (ML), and data mining in pregnancy care. The UX/UI aspect focuses on User-Centered Design, providing intuitive interfaces that cater to the unique needs of expectant mothers. NLP techniques enable the early detection of pregnancy abnormalities, allowing for timely interventions and personalised care. ML algorithms aid in predicting outcomes and identifying potential issues, empowering healthcare providers to make informed decisions. Data mining uncovers hidden patterns within large datasets, facilitating early intervention strategies and improved prenatal care. Future directions involve refining UX/UI design, incorporating domain expertise in NLP models, exploring advanced ML algorithms, and expanding data mining analysis to include diverse influencing factors. Integrating expert knowledge, personalised approaches, ethical considerations, and clinical validation is crucial. Multidisciplinary collaborations will drive the development and implementation of technology-driven solutions. The paper concludes by discussing the potential benefits of integrating technology into routine prenatal care practices, including improved access to care, enhanced patient engagement, and better health outcomes. However, it also acknowledges the challenges and limitations that need to be addressed for wider adoption of technology-driven approaches.

**Keywords:** *Pregnancy Care, Health and Wellness, User Experience/ User Interface*

## Investigating the Impact of Software Maintenance Activities on Software Quality: Case Study

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### Abstract

Software maintenance is crucial for the reliability, functionality, and satisfaction of software systems. Although it might be expensive to keep software in good condition, it is essential to keep the software maintenance expenditure to a minimum without sacrificing software quality. Based on two leading software development organizations in Sri Lanka, the study examines how software maintenance operations affect software quality and identifies ways to reduce maintenance expenses without compromising quality. A comprehensive literature review was undertaken to discern a compelling research problem that would serve as the focal point for the study. The study was conducted using structured interviews with senior and operational staff from two organizations to quantify the impact of maintenance procedures on software quality preservation and proactively identify effective strategies. Both organizations adopt a proactive approach to software maintenance, encompassing bug fixing, updates, enhancements, and security updates while employing testing, quality assurance, monitoring, user feedback, and defect tracking to measure the impact of maintenance activities. Additionally, they predominantly utilize automated deployment, Continuous Integration/ Continuous Deployment, and cloud-based deployment in their software deployment practices, with some adoption of containerization (e.g., Docker) as well. The findings show that software maintenance is essential, and many tasks are carried out to maintain quality, including testing, monitoring, user input, and defect tracking. Future studies should concentrate on creating more efficient maintenance methods to save expenses while maintaining high-quality software. This evaluation offers knowledge that practitioners may use to create efficient maintenance plans for software systems.

**Keywords:** *Software maintenance, Software quality, Cost reduction*

## **Review on Feasibility of Building an Explainable Artificial Intelligence Model for Anti-phishing Detection**

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### **Abstract**

Explainable Artificial Intelligence (XAI) is a field of Artificial Intelligence (AI) that aims to make AI models interpretable and transparent, allowing humans to understand the reasoning behind the decisions made by the AI system. XAI techniques provide insights into how the AI arrives at its conclusions, enhancing trust and usability. The viability of developing an XAI model for anti-phishing detection is examined in this review. The significance of XAI, its principles, methods/types, challenges, ethical issues, and vulnerability aspects are discussed. The areas of machine learning for phishing detection, XAI models for phishing detection, developing appropriate explanation messages for warnings, feasibility issues, and a comparison with conventional approaches are all covered. The importance of XAI in enhancing the clarity and interpretability of AI models are further emphasized in the paper. It shows different XAI techniques, difficulties in striking a balance between explainability and performance, and XAI ethics. The evaluation looks at phishing scams, machine learning detection methods, and the advantages of XAI models. It suggests a thorough strategy for conveying explanatory messages and examines the viability of creating XAI models. In highlighting the promise of XAI to improve transparency and interpretability, the research also acknowledges the difficulties that must be overcome in order to create scalable and reliable XAI models for anti-phishing detection.

**Keywords:** *Explainable Artificial Intelligence, Phishing, Anti-phishing detection, Cyber Security*

## Lymphoma and Necrotizing Lymphadenitis Genes Detecting Software

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### Abstract

Lymphoma and Necrotizing Lymphadenitis are complex diseases characterized by Abnormal Lymph node cell growth and inflammation. The development of powerful software tools for identifying and analyzing genes associated with these disorders has resulted from advances in genomics and bioinformatics. The “Lymphoma and Necrotizing Lymphadenitis Genes Detecting Software” (LNLD-GenD) is described in this study as an innovative application that uses sequencing technology with high throughput and computational algorithms to detect critical genes for diagnosis, prognosis, and targeted therapy. The user-friendly interface of the software allows for seamless integration into healthcare procedures, revolutionizing personalized medicine by classifying patients and predicting treatment outcomes. The study includes a thorough review of the literature as well as an examination of various gene-detection software and databases. Data preprocessing, software architecture, gene identification algorithms, and validation measures are all stated in the experimental design. The findings demonstrate LNLD- GenD’s high accuracy and computational efficiency in detecting lymphoma and necrotizing lymphadenitis genes. Discussions emphasize the software’s potential for improving diagnostic precision and the importance of taking clinical and histological features into consideration. Overall, LNLD-GenD appears to be a valuable tool for gene detection in lymphatic disorders, with the potential to improve diagnosis, prognosis, and treatment options in these difficult diseases.

**Keywords:** *Lymphoma, Necrotizing lymphadenitis, Genomics, Bioinformatics, Gene identification algorithms*

## Investigation Study on Awareness of Privacy Issues in the General Community

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### Abstract

The growth of technology and concerns about privacy have definitely helped society. But, they have also caused new problems, like losing important information or people using personal information in bad ways, which can hurt society a lot. This survey included largely undergraduates and lecturers, as well as a few people from different professions in Sri Lanka. Altogether the survey was passed on to 350 individuals and 312 responses were grabbed. This study provided information about people's frequent use of personal data when utilizing technological equipment. Furthermore, an examination of 15 research papers was conducted to explore ways in which users can be careful while utilizing their personal information in order to safeguard their privacy. The paper explains how regular people utilize their personal information online, whether they are aware of the hazards involved, and how to proceed cautiously.

**Keywords:** *Privacy issues, Rise in technology, Technological equipment, Personal data*

## Understanding User Preferences for Music Player Elements: A Kansei Engineering Approach Towards Designing an Optimal Music Player

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### Abstract

This research study explores the application and best practices of Kansei Engineering (KE) when User Interface (UI) design is created for a music player, with the aim of enhancing usability, user experience, and emotional and psychological visualization on the interfaces. The target group for this study is comprised of university students aged 18 to 25. Data collection was conducted using questionnaires, where participants were asked to rate various music player interface elements using Kansei words to capture their emotional responses. The analysis identified the most significant interface elements that strongly influenced user preferences and emotional experiences. The findings emphasize the significance of KE as an invaluable tool in selecting and modifying design elements based on user feedback and other crucial factors. By including KE principles in the music player UI design process, developers are able to create interfaces that resonate with the emotional and psychological needs of the users within the target group. This study contributes to the field of music player UI design by emphasizing the importance of user-centered design approaches and the integration of KE principles. The results provide valuable insights for designers and developers to create music player interfaces that deliver enhanced user experiences and emotional engagement.

**Keywords:** *Music player elements, Kansei Engineering, User Interface, User Experience*

## Investigating the Application of Kansei Engineering Principles in Mazda Car Design: A Review

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### Abstract

The integration of user emotions and preferences into vehicle design is becoming important in the current competitive automobile industry. Kansei Engineering, a theory for quantifying the psychological and emotional needs of consumers, has emerged as a valuable approach to address these requirements. The study explores the application of Kansei engineering principles in Mazda car design and explores how Mazda uses this approach to create vehicles that resonate with consumers on an emotional level. This review adopts a systematic methodology that includes a comprehensive literature search and selection of relevant articles, data extraction, and insightful analysis to evaluate specific Kansei-inspired design components attempted by Mazda and evaluates their impact on user satisfaction and brand loyalty. By understanding user emotions, Mazda designs vehicles that go beyond functional attributes, establishing strong emotional bonds with consumers. The analysis highlights Mazda's successful implementation of Kansei engineering, positioning them as a leader in creating vehicles that inspire and delight drivers in a highly competitive market.

**Keywords:** *Kansei Engineering, Car design, Emotions, Preferences, Aesthetics, User satisfaction*

## A Web-based Learning System for the Japanese Language Proficiency Test in Sri Lanka

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### Abstract

The Japanese Language Proficiency Test (JLPT) is a standardized exam that assesses non-native speakers' understanding of the language as well as their reading, writing, and listening skills. The majority of people in Sri Lanka take JLPT to obtain the required qualifications to study and work in Japan and improve their knowledge of the language. However, they have fewer requirements to gather the information and proceedings about JLPT. Due to its complexity and numerous letter patterns with varied meanings, the Japanese language is challenging to learn for Sri Lankans. The purpose of this research is to investigate the issues that Sri Lankans faced when they were following JLPT. As primary data, this study mainly focuses on the survey that was conducted through social media platforms from the participants from those who have already completed JLPT. This used statistical methods which were quantitative and used published research studies related to the research area as secondary data which are qualitative. According to the survey results, the researcher identified the main problems that responders faced when they did the JLPT. To overcome these problems, this paper proposed a web-based Learning system with the Japanese bot as an assistant for those who are taking JLPT. Further, this describes the main functions that have to be included in this proposed system and how it could be helpful for the people who are doing this examination. As a future avenue, this system could be implemented as a multi-language system for other language examinations like French and Chinese in Sri Lanka.

**Keywords:** *Web-based learning system, Japanese, Japanese Language Proficiency Test, Chatbot*

## Application of Artificial Intelligence in Prosthetics: A Review

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### Abstract

This review paper explores the application of Artificial Intelligence (AI) in advanced prosthetic devices, including limbs, retinal prosthetics, hearing prosthetics, and orthodontic prosthetics, with the aim of enhancing functionality and customization. The research problem centers around understanding AI's forthcoming impact on prosthetic advancements. The study has two objectives: to identify current AI applications in prosthetics and to project future possibilities. The paper uses qualitative secondary analysis to review existing research leveraging. Leveraging AI algorithms can help prosthetic limbs interpret nerve signals derived from the patient's muscles, resulting in more precise control and operation. AI-driven advancements include myoelectric prostheses that utilize electromyography signals, bionic legs that adapt to different environments based on user feedback, and prosthetic arms capable of executing actions using computer vision recognition. Additionally, AI improves retinal prosthetics by combining neural networks with computer vision techniques to refine facial features, enhance environmental representation, and ensure safety. In hearing prosthetics, AI, machine learning, and neural networks enable devices to adapt to individual hearing needs and background noise environments. AI-based object detection techniques streamline dental implant surgery in orthodontic prosthetics. The integration of AI in prosthetic devices holds the potential to enhance functionality, improve control and customization, and provide a more natural user experience, benefiting millions worldwide with limb amputations, vision and hearing impairments, and dental prosthetic needs.

**Keywords:** *Artificial Intelligence, Machine learning, Neural Networks, Limb prosthetics, Retinal prosthetics, Hearing prosthetics, Dental prosthetics*

## Advancements in Breast Cancer Detection: Exploring Machine Learning Techniques for Accurate Diagnosis and Early Detection

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### Abstract

One of the most prevalent illnesses affecting women worldwide is breast cancer. It increases in countries where the majority of cases are discovered in the late stages. The Machine Learning (ML) technique that is used in this paper to detect breast cancer is retrieved from a digitized mammogram image. It Aims to evaluate and compare the performance of various machine-learning algorithms such as Convolutional Neural Networks (CNN), Random Forest, Support Vector Machine, Logistic Regression, and K-Nearest Neighbours for breast cancer detection. Using a comprehensive dataset of “RSNA Screening Mammography Breast Cancer Detection”, these mammographic images and clinical information are divided into training and testing phases to implement the ML algorithms. The objective was to determine which algorithm yielded the highest accuracy in predicting breast cancer, as this is a critical factor in early detection and successful treatment. Research highlights the CNN gives 95.2% accuracy as the most effective machine learning algorithm for breast cancer prediction. CNN’s ability to learn intricate patterns from mammographic images and its superior accuracy make it a valuable tool in early breast cancer detection. These findings have significant implications for improving patient outcomes and the overall effectiveness of breast cancer screening and diagnosis. CNNs revolutionize computer vision, enabling accurate breast cancer diagnosis and detection through automatic learning and feature identification in medical imaging tasks. website’s backend will employ the algorithm that produces the best results, and the model will categorize cancer as benign or malignant.

**Keywords:** *Breast cancer detection, Machine learning, Convolutional Neural Network*

## Real-time Taxi Demand and Supply Prediction-based on Specific Geo-locations Using Machine Learning – A Systematic Literature Review

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### Abstract

This comprehensive systematic literature review investigates the prediction of taxi demand and supply using geospatial data, a task becoming increasingly critical due to the surging popularity of ride-hailing services. The review harnesses recent advancements in machine learning algorithms and the accessibility of large-scale geospatial data to explore innovative techniques and approaches in this domain. A total of 21 research papers, published from 2017 to 2023, were meticulously selected and examined based on their research objectives, methodologies, datasets, and evaluation metrics. This review clearly explains that the efficacy of taxi demand prediction models significantly depends on data quality and volume, the choice of learning algorithms, and the implementation of appropriate feature engineering techniques. The study shows the great possibilities of using geospatial data and Machine Learning to accurately predict taxi demand. It also highlights the importance of having standard measures for evaluating results and the need for ongoing research to overcome current issues in this area. Our review also explores the application of several machine learning algorithms, like linear regression, decision trees, artificial neural networks, and clustering, emphasizing real-time population data. After rigorous analysis, clustering is identified as the most fitting technique for this study. This review promises to be a valuable resource, providing a roadmap for future research in this dynamic, analytics-based field.

**Keywords:** *Taxi demand and supply, Geo-location, Machine learning, Systematic literature review*