KDU FOCSS

2023

18th January

FACULTY OF COMPUTING
STUDENT SYMPOSIUM

3rd Student Symposium Faculty of Computing

(KDUFOCSS-2023)

"Science, Technology and Innovations for Sustainable Development"

Faculty of Computing
General Sir John Kotelawala Defence University

KDU FOCSS

Faculty of Computing Student Symposium

3rd FOC STUDENT SYMPOSIUM 2023

ABSTRACTS

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Message from the Vice Chancellor

As the Vice Chancellor of the General Sir John Kotelawala Defence University (KDU), it gives me great pride and pleasure to write this message for the 3rd Student Symposium of Faculty of Computing (FOC). Over several decades KDU has established itself at the forefront of tertiary education in Sri Lanka. We pride ourselves in having grown to a university in such calibre and impact that in a short period of time we are on a par with long-standing higher education institutions of the country.

One of the factors that trigger our success is the commitment of its academics and students to research and innovation. We strive for excellence in the fields of defence, engineering, spatial sciences, built environment, architecture, computing, medicine, basic and applied sciences, allied health science, law, management, humanities, and social sciences. This commitment is reflected through the capabilities and capacity of students of KDU and the research output of our University. FOC Student Symposium is one occasion for us to showcase our cutting-edge research in the field of Computing and it allows the young researchers a platform to share and collaborate their research ideas with a large audience.

We have been tirelessly organizing similar events, and I wish to thank every single member of the faculty for their undiluted commitment and energy in organizing this event. I would like to congratulate the Conference Chair and the organizing team for their tremendous effort for the success of the symposium. They have worked beyond their duties and shown a level of commitment that reiterates the values that KDU holds. Further, I wish to extend my best wishes to all those who have published their abstracts in 3rd Student Symposium of FOC.

Wishing you the best of luck.

Major General Milinda Peiris RWP RSP VSV USP ndc psc MPhil (Ind)
Vice-Chancellor
General Sir John Kotelawala Defence University

Message from the Dean – Faculty of Computing

I am delighted that we have been able to organize the 3rd Student Symposium in the Faculty of Computing (FOCSS) of General Sir John Kotelawala Defence University. FOCSS is a forum that brings the novel research ideas of our young undergraduates studying in the Faculty of Computing under various domains of Computing, namely Information Technology, Information Systems, Computer Science, Computer Engineering, Software Engineering and Data Science. Hence, it is with great pride that I pen down my thoughts on this abstract book of the 3rd FOCSS.

Inculcating professionalism in the workforce of a country is essential for its national development, and it can only be achieved through a concerted effort, especially by those involved in the education system. In this respect, FOC has clearly identified its role, and it is committed to the task of assisting the nation by grooming young students to bridge the gap between the need and the availability of a professional workforce to support the country's national development endeavour adequately. As the Dean of the Faculty, I am pleased to note that we strive to maintain internationally accepted standards in the development of our course curricula thus encouraging students in research and innovation. FOCSS is an ideal forum for them to showcase their uncommon innovative ideas and it exemplifies our commitment to enhancing professionalism through collaboration.

Finally, let me congratulate all contributors and express my sincere wishes for a highly successful symposium, and I deeply believe that FOCSS will offer the participants a platform to exchange ideas, discover novel opportunities, reacquaint with colleagues, and broaden their knowledge.

Dr. Asela Gunasekara

Dean / Faculty of Computing

Message from the Conference Chair

For the 3rd consecutive year, Faculty of Computing, General Sir John Kotelawala Defence University (KDU), organises its Student Research Symposium under the theme of "Science, Technology and Innovations for Sustainable Development". It is with great pleasure and honour that the organising committee extends its compliments to all of you taking part in this FOC students symposium 2023. This year Conference held under the patronage of the Dean Faculty of Computing and the support from the Computer Society of Sri Lanka- KDU GenZ Student Chapter.

This year we received total 145 research papers under the five main tracks including Information Technology, Information Science, Computer Science, Computer Engineering, Software Engineering. Research papers were done with double blind peer review process and selected 65 research papers under the five main discipline.

I truly believe that the organising committee of the faculty of computing Staff members in the process of paper review process accomplished a very successful mission. This conference is an outcome of a student who has completed Independence Study research in their third year. Due to the Pandemic and the economic crisis, this year is conference is a tremendous opening for many undergraduate researchers In the Faculty of computing to present their research findings.

In addition, invited speakers will deliver plenary speeches while covering a wide range of important computing sessions with great solutions using science, technology, and innovation.

Finally, I would like to extend my best wishes to all the presenters, authors and participants, joining the conference on site or online, and I hope that all of you will find this conference informative, enjoyable.

DR (Mrs) Nirosha Wedasinghe PhD, MSc, BSc,
MBCS (UK), MCS(LK), FMIEEE(USA), MAIS(US), FISDS(Japan), MISOC
Symposium Chair
General Sir John Kotelawala Defence University

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A Methodical and Comparative Study for Identify a Solution through Artificial Intelligence for Detection of Visual Impairment in Toddlers and Pre-schoolers

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Abstract. Pre-schoolers and toddlers are susceptible to near-sightedness and colour blindness, two common eye conditions. The goal of this research is to provide parents with a method for testing for the two eye impairments listed above in children who are illiterate in both letters and numbers that solution is based on Artificial Intelligence technology. Here, a systematic and comparative investigation based on the review of past research, suggestions of Ophthalmologists and Supervisor and a proper survey from the parents who have toddlers, a more effective way to diagnose the aforementioned two eye problems using the techniques of Human-Computer Interaction (HCI) and Machine Learning models are conducted after analysing prior research publications and taking into account the opinions of eye experts. Analysis of the suggestions of Ophthalmologists, Supervisor and reviews of past research, in accordance with the "Ishihara test," and "Hue test" which are still popular today, colour blindness can be identified by choosing hues from a colour palette that has similar colour intensity, and by giving the child to select images that range in size from large to small, parents can determine whether the child has near-sightedness based on the child's outward behaviour. After an analysis of the survey results from parents, more than 60% of people expressed their willingness to identify the above 2 eye defects of children under the guidance of parents through a game suitable for children's minds. The implementation of a straightforward Android game app using the "Expert System" concept to recognize both of the aforementioned eye anomalies was found to be the best solution at the conclusion of this research.

***Keywords**: Artificial Intelligence, Expert system, HCI, Machine Learning Models*

Rule-based Facial Makeup and Professional Beauty Tip Recommendation System using Image Processing

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Abstract. Makeup can consider as a tool of self-expression just like the painting visualizes its artist's expressions. According to beauty experts, wearing makeup awakes the individual's inner beauty and increases one's self-esteem by making one feel more physically appealing, boosting confidence, and enhancing personality. In any situation, makeup makes it easier for women to blend in. The facial look is greatly influenced by the facial makeup, which makes the face appear more lovely and attractive. Since it requires a skilled artist to select the right makeup look for a particular face and event, individuals frequently choose their makeup from magazines or the internet without taking into account whether it would appear good on them. Additionally, predicting how the face will appear after using the suggested makeup style demands a high level of creativity. An automated women's facial makeup and beauty tips recommendation system is suggested in this research as a computational solution to this issue. The proposed approach models the relationship between facial characteristics and makeup style attributes as well as occasions such as daily makeup or heavy makeup taking into consideration. The system begins to process when a user uploads a portrait image. Classification of the makeup-related facial traits that makeup artists consider deciding the makeup style is done using the 'Betaface API' which has the ability to figure out 22 basic facial points of the woman. Face shape is identified through the OpenCV Haar-like feature. Then the knowledge base contains specific rules and recommends a makeup look for a particular occasion.

Keywords: *facial landmarks, facial makeup recommendation, image processing*

A Solution to Overcome the Student's Smart Phone Addiction and Misuse

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Abstract. In the modern era, the smartphone has become an inseparable companion of most human beings. Although the wise use of smartphones is highly beneficial in daily life, improper use of smartphones has raised several undesirable social outcomes. Addiction to smartphone and improper use of it is the most significant social impact. Particularly, this has become a significant drawback of online education, and the present study is aimed to investigate the impacts of smartphone usage on the academic progression of school and university students and suggests appropriate solutions to overcome the problem. The study has three main objectives examining the current situation of smartphone addiction, analysing smartphone usage & misuse and performing a critical assessment of different strategies that can be adopted to minimize smartphone addiction and misuse. We conducted a questionnaire-based opinion survey with 53 students and 37 parents and conducted a detailed investigation on smartphone addiction and potential solutions. We identified smartphone addiction among students at a significant level, and parents had positive ideas on the wise use of smartphones by their children. Lack of technical knowledge and time to spend for children were identified as the most significant barriers that reduce parents' control over the smartphone use of children. As a solution to this identified problem, we propose a mobile intelligent application that enables parents to monitor and control the smartphone usage of their children. The application would address the needs of parents and students to ensure better control and safe use of smartphones.

Keywords: *smartphone addiction, smartphone usage monitoring, overcome smartphone addiction, mobile usage control*

Impact of Online Hospital Management Systems Related to Patient Registration, Ambulance Management System and Appointment Making

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Abstract. The health sector has become a fundamental part of a developed country. With the advancement of technology, nowadays many people are willing to do many services online. Various types of online systems are also available for hospital management. With the advancement of technology, the online system has helped to make the work of people's life faster and easier. But there are many problems with attendance methods currently in use. This system also enables to build of a good relationship between the clients and the hospital board. This research paper primarily focuses on online patient registration, ambulance management, and making an appointment. Problems encountered in making appointments in the normal way, such as not answering on time, not responding to confirmation, having only limited payment methods, etc., and problems arising in using an online ambulance management system such as lack of necessary facilities in the ambulance, not having enough ambulance agencies, ambulance Absenteeism, staffing problems etc. were also identified. The patient can find relevant doctors for diseases before making appointments. A chatbot can be used for that. In case of an emergency, the patient can find the nearest ambulance. Ambulance crew update's current location every 5 minutes. Patient history records, prescriptions, etc. were included in the patient profile. Then the patient and doctor can find all the patient's medical records in one place. Remedies that can be used to avoid these problems are discussed in this paper.

Keywords: *online patient registration, ambulance management, appointment, chatbot, healthcare, patient's medical records*

An Empirical Study About the Effect of the Technological Advances on the Sri Lankan Tourism Industry

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Abstract. Sri Lanka is also known as the Paradise of the Indian Ocean due to the charismatic atmosphere it has. The industry of tourism in this marvellous state interacts with the 8th United Nations' sustainable goal which is decent work and economic growth as it promotes a massive number of opportunities for the locals by empowering the economy and sharping work qualities. The health challenges encountered in contemporary, not only in Sri Lanka but also in all nations encouraged straightforward digital technology in the traveling industry. So, the usage of the latest technologies such as biometrics, Artificial Intelligence, and mobile technology within the tourism field is known as travel technology. "How technological reinforcement impacts the sustainable tourism industry in Sri Lanka" was the question entrenched in this study. The objectives were to investigate the role of the tourism board towards technology-based tourism in the post-pandemic period, to analyse the satisfaction of tourists with existing software applications that assist travellers, and to capture tourists' feedback for worthwhile travel guide applications. A related literature review was examined as a preliminary study and a questionnaire survey was carried out among international visitors who reached the Island from 2019 to 2022 and 106 usable responses were received. The ultimate aftermath will be an introduction of an innovative travel guide mobile application for the tourism industry in Sri Lanka. The application focuses on implementing a worthy map for destinations based on suggestions made by climate changes and previous travel interests. Also, the application will include auxiliary services such as day and budget planning, tour guide and hotel reservation, contactless payment, and an intelligent chatbot.

Keywords: *Travel, Technology Tourism, Tour Guide Applications, Artificial Intelligence, Mobile Technology, Contactless Payments*

Pet4Care: Identifying the Techniques Used to Find and Track Lost Pets and Proposing the Most Precise Application

WM Subasinghe#, N Wedasinghe

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Abstract. In Sri Lanka, the number of missing pets is rising steadily these days. Pet owners are looking for a remedy as a result. Numerous tracking tools and pet software are available. However, Sri Lanka uses incredibly little of them. With the advancement of technology, today biometrics are used as an identification method. Both the cats and dogs had distinctive nose patterns that resembled human fingerprints. Therefore, this nose print could be used to find lost cats and dogs. This study is about identifying and studying existing applications and the technologies based on which they implement them and, with the knowledge gained, proposing a solution application for finding and tracking pets. The proposed solution, Pet4Care, is based on You Only Look Once (YOLO), Scale-Invariant Feature Transform (SIFT), Approximate Nearest Neighbour (ANN), and the Google API. The YOLO algorithm and SIFT algorithm are used to extract an image's unique vital points and descriptors. These unique descriptors, along with the dog's information, are saved in the database for future matching. The matching is done with the Annoy (Ap). The Google Maps API is used to track the location of the pets.

Keywords: *You Only Look Once (YOLO), Scale Invariant Feature Transform (SIFT), Approximate Nearest Neighbour (ANN)*

An Analysis of the Effectiveness of Using Augmented Reality to Enhance the Performance of Footwear Shopping Applications

SHIDN de Silva#, D Gunasekera

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Abstract. The Sri Lankan footwear industry has sustained for a very long time and has been successful in serving the local market. One of the biggest industries today struggling with e-business models is the footwear sector. The researcher has gone through the existing footwear-selling applications. During the procedure of analyzing the problem, the researcher conducted interviews with footwear sellers and buyers and distributed questionnaires to them. The key obstacle that people have encountered when making online purchases is finding the best footwear product that suits their requirements. This means that it can be difficult to imagine how shoes will appear on their feet and how they will feel when they are worn. The researcher found out that augmented reality can quickly resolve this problem. Augmented reality is a field of image processing that deals with the combination of the real-world and virtual environment. Researchers investigated through ARCore, ARKit, and DeepAR for 3D model visualization. In mobile app development, DeepAR has important features for 3D model rendering such as plane detection, point detection, light estimation, 3D objects tracking, background segmentation, and object placement. Therefore, the researcher has proposed DeepAR technology for footwear visualization. Users will be able to accurately visualize how the footwear will look on their feet in real-time. Finally, the researcher proposes a mobile application that would help customers who made direct online shoe purchases by letting them virtually see how the shoes would look once they were worn. To increase the profitability of the current footwear industry, the proposed system will give greater support.

Keywords: *Deep Augmented Reality, Footwear Shopping, 3D Visualization*

A Study on Rounded Corners is More Attractive in Modern UI Design

SKD Senevirathne#, WAAM Wanniarachchi

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Abstract. This research aims to provide visually impaired people with a better explanation of Rounded corners being more pleasing to the eye when users interact with the system's UI design rather than Sharpe edge UI designs. When we align cards in a row, rounded corners make it easier to count the total number of cards. This is due to the cards' noticeable edges at the corners assisting our eyes in recognizing visual differences. Cards with sharp corners, on the other hand, appear the same and unified from one another, making them less likely to catch our attention. A rectangle with sharp edges necessitates slightly more cognitive visual work than, say, an ellipse of the same size. Our "pit eye" records the circle even faster. Edges enable additional neural imaging tools. Therefore, the process slows down. The study shows that rounded-edge designs perform well to develop better UI kits.

Keywords: *UI design, User Experience, Rounded Corners, Sharpe Corners, Neural Imaging Tools*

Artificial Intelligence-related Mobile Application for Smart Intercity Bus Tracking and Booking System in Sri Lanka

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Abstract. Overall, the bus service is the mode of public transportation that is most frequently used. In particular, in the present situation of Sri Lanka, in a crowded town or city, a bus is the most accessible, most practical, and least expensive mode of transportation. Passengers who are unfamiliar with the timetables and details of the buses may be wasting time, missing the bus, or boarding an overcrowded bus. The best information on existing systems, employed methods, and techniques, Requirements gathering and data analysis techniques such as questionnaires, interviews, and literature surveys are presented, as well as their benefits and drawbacks. The proposed application for intercity bus tracking and booking was identified as the ideal response to a problem area using the aforementioned requirement-gathering methodologies. The best approach to make it available to the users so they can locate the bus and make reservations is through a mobile application. The Quick Response (QR) code technology is used for passenger counting and paying online. The passenger who has logged into the system can pay for a ticket by scanning the QR code. The bus is tracked using the Global Positioning System (GPS) technology. A passenger can track a preferred bus and reserve seats by choosing destinations. Artificial intelligence (AI)-based camera technology is used to count passengers. The technology can assess whether a passenger has seated or not a seat by estimating the distance between the camera and the seat. The development of this app uses tools like Google Firebase, React, and React-native.

Keywords: *Quick Response (QR) code, GPS, Artificial Intelligence (AI), Mobile application*

A Systematic and Comparative Review for Identifying and Providing Solutions through AI for Skin Diseases of Stray Dogs

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Abstract. This research aims to develop an innovative solution using Artificial Intelligence (AI) technology to address the problem of stray dogs' skin diseases and suffering from starvation in Sri Lanka. The study will utilize Image Processing and Knowledge Engineering techniques to create a social media app that can quickly provide the necessary treatment for identified skin diseases, locate stray dogs and assist nearby vet clinics and pharmacies. The proposed solution aims to help animal lovers provide food, medicine, and other needs to stray dogs. The past research also proposed using Fuzzy C-mean techniques, Convolutional Neural Networks, and machine learning models to store and assist in identifying common dog diseases and using image processing techniques to identify skin diseases in stray dogs. The research surveyed people's willingness and methods for helping stray dogs, the results showed that 96.6% of people who were willing to help stray dogs observed were found to have diseases, with lack of proper treatment being the main reason, with the majority expressing interest in providing food and medicine. People had difficulty finding pharmacies and veterinarians to help treat stray dogs with skin diseases and many reported a lack of knowledge about dog medicine and difficulty identifying the specific skin disease. However, 100% of respondents expressed interest in an online social media platform for helping stray dogs. Overall, this research aims to contribute to the development of a more efficient and effective solution to improve the welfare of stray dogs in Sri Lanka and the world.

Keywords: *Artificial Intelligence, Image Processing, Knowledge Engineering, Dogs' Skin Diseases*

An Image Recognition System for Crop Disease Identification of Paddy Fields in Sri Lanka

MA Hettiarachchi#, N Wedasinghe

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Abstract. In agriculture, detecting leaf disease is a challenging task that is used to prevent serious outbreaks. Rapid identification and classification of paddy crop disease can enable farmers to prevent major losses. Technology advancement will aid them in early disease identification, reducing percentage expenses, and making the field appealing for their activities. They are legally liable for much destruction, and they are classified by fungal and bacterial issues. This is the rationale behind the suggestion that farmers use visual cues based on the identification and diagnosis of illnesses affecting crops. The main advantage of utilizing digital image processing in farming is that they are more effective, more detailed, and more productive relative to real-world human beings. Nowadays, image processing is among the rapidly growing technologies. In the real-world farmers and agriculture experts visually inspect agriculture crops such as cereals, commercial crops, fruits, and vegetables as affected by various recognition and classification diseases. However, this process is time-consuming and very subjective in addition. Numerous disease detection, characterization, and quantification approaches have been created and used in various crops. The associated works are contrasted based on picture segmentation, feature extraction, feature selection, and classification. Machine learning technologies and image processing techniques benefit farmers in all cultivation practices. Thus, the proposed work would be able to identify the field issue in a reasonable amount of time, and the guidance would enable the farmer to take the appropriate actions to enhance the quality of crop production, prevent significant crop losses, and reduce manufacturing costs while preserving the environment.

Keywords: *image processing, disease identification, feature extraction, feature selection, classification.*

Kidney Matching Mobile Application using Artificial Intelligence

RAMK Rupasinghe#, DU Vidanagama

Department of Information Technology, Faculty of Computing General Sir John Kotelawala Defence University, Sri Lanka

Abstract. Every year there were over 150,000 chronic kidney patients recorded, and 90% of these patients need a kidney transplant to survive. But still, there is no proper system to match kidneys and communicate between kidney patients and donors. As a solution, an AI-based mobile application was designed to match the HLA reports and communicate between donors, patients, and doctors. The application will use an OCR model to extract data from the HLA report and it will use the extracted data to match the HLA report using a script specified for match HLA reports. The OCR model will be trained to extract decimal numbers and alphabetical characters. The advantage of using OCR technology was to extract the data accurately and to reduce fraud that most kidney patients face nowadays. The application will provide a chat platform to communicate between donor and patient. And a private channel to communicate with experienced doctors. This will allow both patients and donors to get doctor's assistance with their issues free of charge. Above mentioned chat platform is designed to develop using a custom XMPP server. According to the survey, 56% haven't found a kidney in the right time period and 99% would like to use a mobile application for HLA matching. With these results, it seems this application will be a great support to kidney patients and donors to find matching kidneys without any time wastage and without being caught in fraud. And this app will allow patients to communicate with doctors who are willing to help with their needs.

Keywords: *Artificial Intelligence, Optical Character Recognition (OCR), XMPP Server, Android*

Study of the Factors of Employees' Behaviour towards Information Security in Sri Lanka Army

CG Hewawasam#, WAAM Wanniarachchi

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Abstract. Information is increasingly becoming a valuable resource for an organization. Particularly in a military organization like Sri Lanka Army. Information security is considerably more crucial than physical security. Information security in an organization is greatly influenced by human behavioural aspects. Adapting advanced technologies for Information security is not always effective at enhancing security within an organization. Despite all the technology safeguards in place, data breaches will still happen in most businesses. This is due to the fact that information security is a problem with people as much as technology. Managing the human component in information security is critically essential since human behaviour is the weakest point in information security. Based on the literature review a conceptual framework was developed identifying and discussing principal theories that relate to the study. The study's theoretical framework is divided into two distinct phases, and it is being conducted using a mixed-mode research methodology. The quantitative research strategy and the qualitative research approach were employed as part of the mixed-mode research methodology for the investigation. On a five-point Likert scale, the direct factors had an average scale value of 3.545 out of five points and indirect factors had an average scale value of 3.684 out of five points. Based on the analysis's findings, it was determined that both direct and indirect human variables had a moderate impact on SLA.

Keywords: *Information, Information Security, Human Behaviour*

Enhancing Sri Lankan Tourism: Addressing Linguistic Barrier under the Aegis of QR Technology & Machine Translation

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Abstract. Tourism is rapidly expanding due to its economic significance. Unfortunately, current Sri Lankan tourism is one step forward and two steps back. An escalating economic crisis is harming tourism, a significant source of income that had just begun to recover after three difficult years. Therefore, now is the right time to boost up and, despite all the negative impacts on the Sri Lankan tourism sector, pitch in with QR technology to assist tourists in searching for destination information and using AI-driven machine translation to avoid the language barrier. To discover fascinating locations, Sri Lanka still uses the old-fashioned way of giving printed guidebooks. Therefore, tourists may have conflicts during their visits. It is more appropriate for travellers when there is a QR code placed in a scannable location to provide the tourists with more details about the destination, making it easier for foreigners who do not speak the local language to obtain information. The information is provided in either text or audio format by a virtual assistant, allowing tourists with disabilities to enjoy their trip without any hesitation. When the displayed QR code is scanned, the traveller is directed to a web page that contains the information. QR technology is becoming more available to the public, this study includes how to utilize QR codes, the flexibility it provides travellers, and the sustainability of using multilingual content with the aid of neural machine translation, which involves automatically translating words and phrases from the source language into the targeted language. Since natural languages contain intricate grammatical rules, an attention mechanism is placed between the encoder and decoder; therefore, during the translation, the sentence is encoded into a machine-understandable vector, and the decoder provides the proper translation.

Keywords: *QR technology, neural machine translation, the language barrier.*

An Automated Calculation System for Long-Range Marksman in Sri Lanka

MR Ariyarathna#, D Gunasekera

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Abstract. A sniper is a highly trained soldier who specializes in shooting targets from a long distance with modified firearms. The primary duty of a sniper on the battlefield is reconnaissance. Military snipers use lethal shots that kill without warning to weaken the enemy's will and ability to fight. Then, snipers must get the correct target every time in a short period of time. The taken target depends on facts like gravity, wind speed, spindrift, and temperature. Also, to get the target snipers must calculate the minute of angle, MRAD measurement, inches, scope click adjustment, and distance using the above-mentioned facts. There are automated systems exist in the world to perform these calculations. But in Sri Lanka, snipers do these calculations manually and it is quite a complex task because wind speed, temperature, and distance can be changed from time to time. Due to that reason, snipers take some time to get the target on the battlefield or in training and sometimes miss the target.

Strategies for gathering requirements and analyzing data, such as surveys, interviews, and literature studies, clearly convey ideas about existing systems, methods and techniques used. According to the gathered and analyzed data, the best solution for the problem is to develop a mobile application to measure the distance and perform the calculations. The paper describes the mechanisms of automatic calculation systems to improve the performance of snipers. The calculation mechanism allows snipers to get the right information to take the right aim. The purpose of this paper is to provide a concept to develop an automated calculation system for Long-range Marksman in Sri Lanka using image processing.

Keywords *– Calculation system, Wind speed, Distance, Automated system*

Automated Toll Collection and Accident Detection System

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Abstract. Nowadays almost all highway tolls are manually controlled, with an operator collecting cash from the driver and issuing a receipt because this procedure can be time-consuming. Frequently we can see traffic delays at toll gates now. That is not all a significant number of people die via road accidents all around the world. This research mainly aims to provide a sustainable solution by incorporating a more effective payment option and automatic traffic accident detection system. So, traffic congestion is reduced and alleviates the time duration when an accident occurs and when first emergency responders are dispatched to the destination where the accident locates. Current using mechanisms are systemized to make use of a vehicle's built-in automatic accident detection and warning systems. Those systems are effective, but they are costly and not user-friendly either. Also, maintenance of those systems is intricate and not available in all vehicles. The capability of detecting traffic accidents using smartphones. On the other hand, it has just gradually been possible due to developments in processing power and sensors which are attached to smartphones. The proposed system is divided into two stages: Payment is made through the application which is used the top-up amount of cash. During the acknowledgement of the mishap scenario soon after and it will be reported to the relevant parties. Evident information such as location is sent to the emerging sectors for a quick response. This system also contains a controller which transmits an alert if a vehicle is detected when it is exceeding the speed limits

Keywords: *Auto toll pay, accident alert system, toll gate, over-speeding alert*

Research Direction for Automated Online and Offline Hiking and Camping Supported Website

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Abstract. Nowadays most popular outdoor sport in Sri Lanka is hiking and camping. Both local and foreign visitors love to go on hikes and camping trips to take in the scenery. When camping and hiking, travellers encounter a variety of challenges, including unforeseen bad weather, not knowing how to set up the tent properly, getting sick or hurt, not having enough food, being too cold at night, and not knowing the destination. Need to develop a new automated system in addition to the current one to help travellers in Sri Lanka in order to address the aforementioned problems. According to the survey and analyzing literature the younger age group (18–25) is most likely to enjoy adventure hiking and camping without a guide. There are many difficulties users were experiencing and hearing their opinions on previously used mobile applications and websites. Based on the viewpoint of the traveller, determine the specifications and recommendations for a new system. The new automated system should include a number of additional components, according to the observation of survey results. The new web page suggested alternatives are trail comparison, weather forecasts, date setting, live chat with a guide, choosing locations to rent camping gear, using an online and offline map, utilizing an online map, and near me (location-based search). Then, hikers will have the chance to reduce their numerous issues with choosing a hiking and camping trip, as well as the issues they ran into while hiking. The suggested approach also enables tourists to buy travel-related gear

Keywords: *Hiking and camping, web page, travellers*

The Purpose of a Swimming Web Portal for Sri Lanka: An Analysis

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Abstract. Swimming is a world-popular physical activity that integrates arm and leg actions with natural flotation of the body. This is an excellent stress reliever because it releases endorphins, which give a sense of well-being and happiness, and ANP, a stress-reducing hormone. In Sri Lanka, the majority of people are doing swimming as a sport, and some are willing to do this. Most people don't know how to swim, where they can learn, how to find a certified coach, or what they should wear when swimming. The objective of this paper is to identify the problems that occur when swimmers find certified coaches, the nearest pool, and the swimming equipment shops. This research was conducted using both qualitative and quantitative data. This mainly focuses on the survey conducted to the swimmers via a google form using social media platforms as well as interviewing some of the leading swimming coaches in Sri Lanka to identify their perspectives on this study. According to the survey, mainly identified the problems that the responders faced, and the interview mainly focused on the exact coaches' experience and qualifications. To overcome these issues, this research paper proposed a web-based swimming portal for Sri Lankans who are swimming. This includes the previous techniques used for the web portals and the main strategies that can be added to the swimming portal. In the future, this portal can be implemented for diving, lifesaving, surfing, synchronized swimming, underwater diving, and water polo.

Keywords: *Swimming, sport, certified coach, web-based*

Evolution of Online Trading Marketing in Sri Lanka

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Abstract. Research on the assessment of online trading options in relation to different financial services. The primary goal of the study was to assess the online trading platforms via which a set number of transactions were made. 200 people made up the sample size for this descriptive paper study, which had a small number of participants. Primary and secondary data-gathering methods were employed in this investigation. A systematic questionnaire was employed in this study by the firm to collect the essential data. The analysis and interpretation process employed percentage analysis and graphical representation. This essay largely focuses on consumer feedback and solutions that might help businesses manage problems more effectively. The results showed that the majority of respondents were happy with the organization's online trading services. The job would undoubtedly assist in predicting client wants and assisting the business in taking the appropriate actions.

Keywords: *Online Trading, E-Business Development, Business promoting.*

Information Systems

Information Systems

Technical Session Chairs

Technical Session I	*Dr (Mrs.) Nirosha Wedasinghe*
Technical Session II	*Ms PRD Wijesinghe*

AI-Based Crowdfunding Platform Secured with Smart Contract as a Means of Encouraging Entrepreneurs of Sri Lanka

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Abstract. At present, industrial progress is defined by a myriad of possibilities, all of which differ in terms of design or technology used. However, not all of them are thriving as the market weeds out the winners and losers in the race for innovation. Furthermore, the growing number of potential financing sources for these activities does not ensure that a technology solution produced will not fail. This is because just a little number of entrepreneurial incentives will meet the crowd's backing. The popular choice, on the other hand, will thrive. This approach is likely to be aided by crowdsourcing. Trust is vital for all parties involved in generating monetization, including the contributor, the fundraising platform service provider, and even the fundraiser. This study aims to uncover success factors for Sri Lanka that influence the execution of crowdfunding projects that are hosted to generate money for their businesses. Funding information is gathered both locally and internationally via interviewing both funders and entrepreneurs. The outcome of this research shows that Ethereum or Blockchain-based smart contracts might be employed in significant crowdfunding campaigns. This study offers a suggested conceptual framework developed by evaluating contemporary literature providing facts that contribute to the development of enterprises through crowdfunding and assessing information obtained from Sri Lankan entrepreneurs.

Keywords: *Crowdfunding, Smart contract, Blockchain, Entrepreneurial culture*

A Systematic Review and Comparative Study of Stock Market Prediction and Algorithmic Trading via Machine Learning

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Abstract. Predictions about Stock prices are more common than ever. Due to its being so volatile, the stock market is impossible to predict. To forecast what will happen to the stock market in the future, there are no guidelines to follow. Since the market trend is always shifting based on a variety of factors, making accurate predictions is extremely difficult. The aim of this utilizing machine learning techniques, to forecast stocks and maximize profit. The influence of numerous factors on stock prices makes stock prediction a challenging and extremely complex task. To overcome these issues, machine learning techniques linear regression, SVR (Support Vector Regression), K Nearest Neighbour, Random Forest, Artificial Neural Network, Recurrent Neural Networks and Long Short-Term Memory (LSTM) have been used in this work to anticipate stock prices. In this research previous studies regarding stock market predictions have been analysed, to find the best-suited machine learning algorithm to predict stock prices. As a result of this study, it was found that the best-suited algorithm for predictions and automated trading, is LSTM due to its accuracy, less time-consuming nature, and ability to handle large data sets.

Keywords: *Algorithmic Trading, Stock Predictions, Long Short-Term Memory (LSTM)*

Higher Education: Virtual and Physical Course Management System

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Abstract. This essay provides a quick analysis of the potential impact that Sri Lanka's physical and online university systems may have. Universities today are required to offer online versions of their curricula and support services. Virtual universities demand a new paradigm in higher education. A virtual university provides higher education programs through electronic channels, most frequently the Internet. Online education is offered by certain traditional colleges as a part of their lengthy university programmers. Both physical and virtual universities will assist people in continuing their higher education while holding down full-time jobs. Virtual and real environments demand careful planning and design when mixed. Many online courses use web-based slide displays, computer conferences, and file-sharing websites to convey their content. When online education first began, the primary means of delivery was a two-way audio-visual network. These web-based distribution techniques are used to broaden the accessibility of programs and services. Only a few of the numerous teaching techniques accessible in virtual education include courses based on hypertext, videos, audio, emails, and video conferencing. This university encourages active collaboration between students from traditional and online universities. The course modules may be implemented in accordance with university policies, which follow a common structure used by other universities. Thanks to technological solutions, tests may be planned, administered, and managed online by any industry or institution. can be carried out over a local area network, an intranet, or the Internet. The online hiring process aids in finding candidates that are eager to work at this university.

Keywords: Virtual University, Higher -education, Courses

An Analysis of Japanese Bot to Evaluate 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. But 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 objective of this research is to investigate the issues that occur to people when doing the JLPT. As primary data, this study mainly focuses on the survey that was conducted for the ones who did JLPT by using platforms like WhatsApp and Instagram. This used statistical methods which quantitative. Published research studies related to the research area were used 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 Japanese bot as an assistant for those who are taking JLPT and describes the main functions that have to be included for this proposed Japanese bot and how it could be helpful for the people who are doing this examination. In the future, this Japanese bot could be implemented as a multi-language bot for other language examinations like French and Chinese in Sri Lanka.

Keywords: *JLPT, Japanese, Language, bot, web-based system*

IoT-Based Safety Management System Through Smart Street Lightning: A Step Toward the Humanistic Society's Safety for Women

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Abstract. The country Sri Lanka is becoming unsafe for women as well as human society. The past decade has been a tumultuous one with rapes, murder, harassment, etc., have put pressure on the quality of life around the world as well as in Sri Lanka. The Internet of Things (IoT) plays a significant role in automating a variety of processes, including health monitoring, traffic management, agricultural irrigation, street lighting, entertainment, classrooms, etc. Streetlights are now operated manually, which wastes a significant amount of energy globally and needs to be altered. In this paper, I looked at the application of IoT in creating smart streetlight safety systems for the modern day. In addition to developing street lighting for the entire world, finding solutions to the energy crisis is crucial. In this paper, I suggest an IOT-based system called the IoT-based smart streetlight and women's safety system, which is of great significance since it helps women who are in danger overcome these challenges. The Smart Street Light System immediately solves urgent issues including, among others, maintenance costs, women's safety, and criminal detection. To ensure safety and respond quickly to incidents, our proposed system includes IoT, telecommunication technologies, one machine-to machine (M2M), and real-time monitoring. Nanotechnology might be used to reduce the size of the module. In streetlights, this takes the form of new, upgraded safety lighting. The goal is to establish an IoT environment.

Keywords: *Internet of Things, Smart Street Light, Safety System, Microcontroller, Microprocessor*

How the Internet of Things Affects Smart Agriculture

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Abstract. Agriculture is one of the oldest economic enterprises, having given a means of subsistence for thousands of years. Human-centred farming approaches are becoming expensive. Smart agriculture and farming technology, " have arisen as new scientific disciplines that use data-intensive methods to increase agricultural productivity while decreasing environmental effects. Seasonal climatic conditions are altering critical assets like land, water, and air as a result of these cultivating methods, resulting in food insecurity. In today's world, technology is constantly advancing, and a wide range of agricultural products and methods are available. In the agricultural industry, knowledge processing is the IoT option. All information may be obtained using the given sensors. Risk reduction, industry automation, higher productivity, animal inspection, environmental monitoring, greenhouse roboticization, and crop monitoring Almost every industry, including smart agriculture, has been affected by (IoT)-based technology, which has shifted the industry's focus from factual to statistical. The implications of the paper's smart agricultural invention are highly dangerous. In this methodology, we divide farming into two sections. Crop field as the production process is done and the warehouse as the store harvest. Multiple sensors can detect the changes around the field and the farmers can get to know the situation about the crops and the field through the system. IoT is utilized in agriculture to increase time efficiency, water saving, crop monitoring, soil management, insect spray, chemical safety, and other areas. It also removes human work, deconstructs agricultural practices, and makes a difference in the application of smart farming.

Keywords: *Internet of Things, Smart Agriculture, Smart Farming, Sensors*

Critical Analysis of E-Commerce Infrastructure in Sri Lanka: Challenges and Potential Directions for Development

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Abstract. The presence of e-commerce technology has been a significant influence on businesses' success in today's world. Electronic Commerce can be defined as a strategy that allows consumers and businesses to buy and sell products and services through the Internet. Although there is a huge development occurring in the e-commerce sector with the continuous advancement of the IT field throughout the globe, Sri Lankan society seems to be a bit reluctant to adapt to this situation. This study's primary goal is to identify problems preventing the adoption of e-commerce technology in Sri Lankan society and to identify necessary solutions to give solutions. Information was collected via a survey and through past studies which link to the problem. According to this research the low computer literacy of the public, Government policies, people's mistrust to use the online platform and Lack of telecommunications infrastructure are some of the matters that cause the inefficient growth in Lankan e-commerce platforms so far. In order to prevent the above matters and to have consistent and strong growth in e-commerce platforms in Sri Lankan Society, this study suggests some valuable suggestions. As the computer literacy of Sri Lanka grew rapidly due to covid pandemic, the government should bring more reliable and suitable policies into action. With that proper marketing knowledge about the latest marketing strategies (digital marketing etc.), accountable and reliable service will lead existing and upcoming e-commerce vendors to gain a trustworthy consumer base in Sri Lankan society.

Keywords: *e-commerce platform, Small and medium-sized enterprise, Sri Lankan society*

Disease Diagnosing System for Vegetable Crop Cultivation Based on Image Processing

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Abstract. Sri Lanka is an agricultural country, and it is one of the main incomes of the country as well as there is a large number of people who do farming as their main economy and living method and their families depend on agriculture. Apart from paddy cultivation vegetable crop cultivation is taking a major place in Sri Lankan dry zone. If we focus on vegetable crops there are hundreds of crop species cultivated in Sri Lanka. There are numerous crop diseases that damage vegetable crops in Sri Lanka and most of them still haven't been identified exactly it is the same as for the many numbers of differentiated diseases which affect agriculture. The primary goal of this study is to identify illnesses in vegetable crops growing in Sri Lanka's arid zone. There is much research done in Sri Lanka to identify diseases by processing plant leaves, roots, flowers etc... but there is a gap in identifying diseases by considering the stem of the plant and how the disease has affected it. So, my research is interested in identifying diseases of vegetable crops grown in the Sri Lankan dry zone by processing the diseases affected to the plant stem. Image processing is employed to extract information from disease plant stems, and CNN algorithms are used to classify different diseases in a very accurate and fast manner. Identifying diseases and being knowledgeable about the steps that must be taken to limit the effects of diseases is a big issue for farmers. This study discusses a disease diagnosis system that uses a CNN-based image processing approach to identify diseases for vegetable crop cultivation and to keep farmers with low literacy informed about measures to take to reduce the impact of various diseases on cultivation.

Keywords: *Image processing, CNN, Disease identification, Vegetable crops*

Supermarket Product Positioning System to Locate the Products

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Abstract. Supermarket product positioning system defines the exact location of products and services based on customer requirements to win the market share over competitors. This system assists customers in locating the item or grocery that they need to purchase. This software allows the user to browse the item availability as well as the item placement, which comprises the rack location and the position in the relevant rack. This system allows the user to meet their needs without experiencing rushed. The system benefits both customers and customer care representatives. This technology allows the user to search for their product using the supermarket search and locate the product position with the specific place in the rack; if the product is not available, the application will notify that item is not available Whether the Product is not available the application may feature the customer to find related products that are available. This application does not feature GPS because it may not always provide accurate data in Sri Lanka. The system uses a smartphone to deliver with no equipment, cameras, or installation required. When the company more focuses on retail, this app assists clients in navigating "large-scale" stores and supermarkets.

Keywords: *GPS Navigation, Location Identification, Supermarkets*

A Solution to Search, Direct, and Locate a Book in a Book Fair

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Abstract. A book fair is a place where publishers and booksellers display their books and related materials in order to increase book sales. It provides opportunities for visitors to obtain international books that may not be available in the country and enhance their knowledge. Since there are many stalls in a book fair, it is convenient to have a system to search for available books in the fair, but these kinds of systems are currently not available in Sri Lanka. Due to that reason, visitors have to waste potential time and effort to search for books and stalls at the fair though the organizers provide a printed map to find locations.

Procedures for acquiring requirements and analyzing data, such as surveys and literature studies, clearly convey ideas about existing systems, methods, and techniques. According to the data gathering and data analyzing techniques the best solution is to develop a mobile application with visual indoor navigation. The paper describes mechanisms of searching for a book and giving directions to the visitors to navigate an exact location to enhance the performance of a book fair. The book search mechanism allows the visitors to check the availability of a particular book using the title of the book or the author's name. By providing a navigation facility, the visitors can get directions to the exact location that they want to go. The goal of this paper is to give a concept to create a Mobile Application that assists in finding a specific book and displays the way to the location where the book is located. The service provides the facility to search for the availability of books and map-based guidance to the selected location.

Keywords: *Search book, Indoor Navigation, Mobile Application*

Analysis to Find an Efficient Stock Market Prediction System

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Abstract. Stock market research Forecasting is fascinating topic. it has an impact on investors' life because they choose which stocks to buy. This entails extensive risk analysis because the choices they make could result in loss. But if some algorithms can be used to make the proper choices, many investors may become millions. This aspect alone encourages many traders and scientists to pursue stock market analysis. But it might be difficult to know when to invest and when not to. This study compares a number of stochastic models, as BLM model, AI net, analysis fundamental net, Jorge frank model, in order to forecast ended share market prices of the Colombo stock Exchange. In this study, the performance of the AFN model in comparison to other models for making predictions was quite amazing. The model has shown to be reliable in forecasting future stock market indices. Through evaluation of several characteristics, including accuracy and precision as computed by MAPE, the robustness of the model has been verified. For complicated time series with both linear and non-linear components, hybrid models can be employed successfully to increase the forecasting model's accuracy

Keywords: *Stock market exchange, BML model, Jorge frank model*

Guided Approach to Automate the Hospital Pharmacy Management System

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Abstract. In general, electronic technology has been used to automate conventional systems. As a result, many copies of management systems with varying scopes were offered. The development of pharmacy systems to support working processes in both hospital and community pharmacies has taken place over the last 40 years in the UK, the US, and other countries. For the purposes of this chapter, pharmacy systems are defined as computer systems designed specifically for pharmacy departmental use These systems encompass both commercial and individual services, such as healthcare. Traditional data management systems for pharmacies, for example, suffer from capacity, time consumption, drug accessibility, maintaining the medicines storage, medicine labelling, patient medication records, decision support for drug interactions and other warnings, stock control, ward inventory management, order processing and the necessity for skilled employees in accordance with employer expectations. The proposed Pharmacy Management System for the BIO-LAB Pharmacy begins with project planning, as well as establishing the system's users. Users and designers iterate through the phases of analysis, design, and implementation until a final system specification is reached. By importing new patient records, the proposed system was put to the test in terms of registration, release, and update functionalities. The proposed system supervises and regulates a hospital pharmacy studio-based sensing cycle. The presented system contains a SQL Server database and a Visual Studio-based GUI design. Many case studies, such as enrolling a patient (inpatient/outpatient), providing drugs to this patient, and obtaining pharmaceuticals from a warehouse, have been used to test the system. The test findings revealed that the examined system outperformed the control system in terms of fewer failures and more effective actions.

Keywords: *Database, E-pharmacy Management System, Store Management*

Decision Support System for Local A/L Path Selection based on Knowledge Management Concept

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Abstract. The government of Sri Lanka subsidized free education from primary to graduate levels. Consider the following aspect of the educational process: the A/L (G.C.E) examination is a cross point for university entrance. Therefore haven't clear guidance material, after the O/L examination, to students, subject, and stream selections for the A/L examination. After analyzing the situation, it became clear that, following the O/L examination, students sought advice from a variety of sources regarding their A/L stream choice. They received feedback from parents, teachers, undergraduates, relatives, and someone who is involved in subject selection as a trend. Furthermore, when preparing for A/L, some students have no idea what related degrees, jobs, and opportunities are available based on their subject selection, and if not satisfied with their decision, they change it again, potentially wasting their time and money. Consider the review of analysis and, therefore, a knowledge management-based decision support system helps to build reference-based correct direction for users to make suitable stream selections. Furthermore, as a decision support system for the A/L subject selection concept-related, have not yet developed any knowledge management or knowledge sharing system. This paper attempts to define the concept of developing a decision support system for A/L path (subjects and stream) selection-based knowledge management concept for anyone who wants self-guidance and knowledge about A/L subjects, the syllabus, related degrees of university entries and job opportunities.

Keywords: *knowledge management, decision support system, A/L subject selection, Higher education*

A Web Portal for Buying & Selling Coconut Products and Services Domestically

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Abstract. The coconut products trade is playing a key role in Sri Lanka. which accounts for roughly 12% of all agricultural production in Sri Lanka. The total land area under farming is 395,000 hectares and about 2,500 million coconuts are produced per year". The research is to create a web portal as an IT solution for, identifying current limitations (Mainly there is not any proper platform for buying & selling coconut products and services domestically) in the coconut products buying and selling industry in Sri Lanka. The portal, which is named eCOCO helps customers, buyers as well pluckers to meet and continue their business requirements efficiently. "eCOCO" allows both buyers and sellers to register with their products or services of interest, together with their name, address, location, contact details etc. Through the web, the portal business enhances customer relationships and also using social media marketing, the business, markets its portal and helps to take market value domestically. That helps sellers (SMEs) to add some kind of value to their products. And also, helps enhance the demand for coconut base products island-wide. That helps to enhance business profit and target customer base. To create a system, suggest using technological methods, PHP Storm IDE for the Scripting Language of PHP, JavaScript and HTML, CSS, and Bootstrap as well as Laravel using as the framework. phpMyAdmin on the XAMPP server and MySQL languages used for the database design. Use as technological methods, PHP Storm IDE for the Scripting Language of PHP, JavaScript and HTML, CSS, and Bootstrap as well as Laravel using as the framework. phpMyAdmin on the XAMPP server and MySQL languages used for the database design. As well as the flow chart of the web portal shows the flow of the suggested structure of the portal.

Keywords: *Social media marketing, E-commerce platform, SME (Small and Medium Entrepreneurs)*

Computer Science

Computer Science

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

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Abstract. Sri Lanka is a country with a good background in crop cultivation. In ancient times, the only occupation available for most citizens was cultivation. With the economic issues, cultivation is going down the stream. Automating the agricultural process will develop the country's economy as well as the life patterns of the citizens. This research aims to study the existing systems developed using WSN and identify the best technologies and sensors for a WSN to be developed to facilitate large farms in Sri Lanka. This study was conducted under two main topics: 'wireless sensor networks in agriculture' and 'other technologies used in agricultural as well as for object detection'. A systematic literature review is conducted to review the existing technologies. From the collected research work, the most important research papers were selected by reading the abstracts and the introduction. Most of the WSNs were developed with the ZigBee protocol as it is the most recent and easily scalable protocol out of the available protocols. Sensors were used to detect light, temperature and humidity. Few research studies were embedded with an expert system to provide expert decisions for the farmers regarding their cultivation. Cameras were deployed in the sensor nodes to capture images of the field. This review study concludes that the Atmega128L is the most suitable controller of the node, along with the ZigBee protocol and other sensors. Furthermore, DTE is the best algorithm for object classification and detection.

Keywords: *Wireless Sensor Network (WSN), Precision Agriculture, Image Processing, Agriculture, Object Detection*

Music Recommendation using Personality Prediction with Machine Learning

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Abstract. Music is one of the digital era's most widely used forms of entertainment. The availability of many genres of music has substantially expanded along with the development and volume expansion of digital material. As a result, delivering the best music to listeners has become a crucial area of study in computer science. Music recommendation systems minimise human labour by automatically suggesting songs and artists based on genre, artist, instrument, and consumer opinions. Furthermore, the recommendation systems can be improved with the user's personality. Personality-based music recommendations will improve the user experience. Hence, we conducted a review study to find the limitations, technology and models used and case studies of the personality-based music recommendation system. The review study results convey that the Cold Start problem and insufficient data are some problems encountered in Music Recommendation Systems. Also, the Hybrid model can be considered ideal from several recommendation models used in recommendation systems. Various personality schemas are introduced to measure personality, and one of the famous and accepted ones is the Big-Five personality model, which describes personality based on five factors.

Keywords: *Personality Prediction, Personality, Music Recommendation, Big Five Personality Traits*

Prevention of Cyberbullying Using Machine Learning: A Review

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Abstract. With the advancement of technology, social media has grown to be widely popular. Although social media platforms provide excellent opportunities, they can pose a negative impact on users. Cyberbullying is one such adverse phenomenon which can occur online through social media, forums, or games where users can read, interact with, or exchange content. Cyberbullying and online harassment can impair people's lives causing victims mental and physical distress and often leading to extremes such as suicide. Social media platforms have provided users with options such as flagging, blocking, or reporting the bullies fostering a safer online community. But due to the alarming amount of reported content and users daily, there is a need for automated, data-driven methods in detecting and preventing such harmful activities in social media. It will help foresee potentially dangerous and harmful situations and prevent them from occurring. Machine Learning based approach is used in most existing systems to tackle this problem. There exist several knowledge gaps in detecting and preventing cyberbullying on social media such as the effectiveness of current automated prevention and intervention methods and the impact of anonymity which can make it difficult to identify and hold bullies accountable. This study is a systematic literature review where similar existing systems are explored, examined, and analyzed. The purpose of the study is to identify and examine the features, methods, and limitations present in the systems which will help discover a novel solution to mitigate the adverse effects on people. It was identified that the utilized algorithms in applications have performed in various ways depending on the specific characteristics of the dataset and the problem at hand. Furthermore, most research has been done on text-based hate speech detection and is considering combining textual data with video and images as future work.

Keywords: *Cyberbullying, Machine Learning, social media, social networks*

Route Optimization with Fleet Management

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Abstract. Finding the best route to deliver is one of the most essential items in a courier service all around the world. Therefore, having a route optimizing and fleet managing system can be very useful for courier service drivers as it helps to provide the dispatchers with a cost-efficient route, prevent unplanned stops, and reduce bottlenecks within the delivery network by avoiding heavy traffic. There are few fleet managing systems around the world but currently, there are no such well-developed systems in Sri Lanka. The aim of this project is to develop a route-optimizing and fleet-managing system using functions that are used in the existing systems while adding new features and advancing some of the existing functions. The cause of this project is to study a problem related to both the Courier Service companies and package deliverers of those corresponding companies in Sri Lanka. Here, the path is adjusted to allow for the quickest delivery of the packages while still taking the optimal route. This helps ensure that all items are delivered promptly. In this project, the created system may be utilized to assist dispatchers in finding economical routes, avoiding traffic, increasing throughput throughout the day, and enabling administrators of delivery companies to effectively manage fleets.

Keywords: *fleet management system, route optimization*

A Review of Diet Recommendation systems: with a Focus on Development Approaches

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Abstract. Nourishment and a balanced diet are essential for human health, physical development, psychological development, and overall well-being. All forms of malnutrition, obesity, and non-communicable diseases, such as cancer, diabetes, and heart disease, can be avoided by maintaining a healthy diet. However, due to a lack of understanding of nutritional values and other diet-related criteria, many are unable to maintain a healthy diet. Though some people get advice from experts regarding diets, some people cannot take that advice due to time and financial constraints. A diet recommender system would be an effective solution to this problem. This study aims to examine the status of the current diet-recommending process while focusing on existing approaches to diet-recommending systems. This study includes diet recommender systems that have employed various recommendation methodologies and were found by conducting a literature search. Additionally, this also studied about ongoing food recommendation process through expert consultation. The study's findings show that the current recommender process is a fully manual process done by experts in the field. The survey results conclude that the age, BMI, mealtime, medicines they use, food allergies, income (whether the diets recommended are affordable to the user.), and food combinations that must avoid (Ex: Ginger and Manioc) as the only factors to consider when recommending food with 68% of expert responses. Then the rest of the expert responses were to consider food preferences, activity level, and added preservatives in addition to the above-mentioned factors. 23 out of 25 experts believe that automated diet recommendation systems should have constant supervision of an expert in the Field. Furthermore, the literature survey results convey that Machine Learning (ML), and Fuzzy logic can achieve higher accuracy in diet recommendations. This study concludes that developing an automated diet recommender system using Machine Learning (ML) and Fuzzy logic will provide an effective solution for most of the problems in the current food-recommending process.

Keywords: *Diet, recommendation, Food, Machine Learning, Fuzzy logic, Muti-Agent, Cloud*

Blockchain-based Medication Supply Chain Tracking: A Systematic Review

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Abstract. Fake medications that appear like genuine medications are a global issue that has not been addressed yet with a proper solution. The World Health Organization (WHO) mentions that 1 out of 10 medications are found to be counterfeit medications in developing countries and it is affecting almost all the countries in the world adversely. The drugs manufactured are distributed to hospitals and pharmacies where the consumers receive these medications through distributors. Counterfeit medications mostly enter the drug market through distributors. Due to this issue, millions of deaths and lifelong diseases are reported globally. To overcome this issue, several studies have been conducted by tracking the drug supply chain from beginning to end utilizing blockchain technology. Also, if information relating to the supply chain is made transparent, counterfeit drugs can be prevented. The aim of this paper is to present a systematic review of the existing studies on blockchain-based systems that track the supply chain of drugs. A comprehensive search strategy with search criteria was used in this paper to select the appropriate studies out of many different studies. The selected studies were then subjected to quantitative and qualitative analysis. The findings of the selected studies indicate that utilizing blockchain can bring security and transparency to drug supply chain tracking systems. Malicious attacks such as middleman attacks are not possible when blockchain is used due to its high security and therefore using blockchain is the best solution for this growing issue.

Keywords: *Blockchain, Supply chain tracking, Counterfeit drugs, Decentralized system*

Fatigue Detection of Air Traffic Controllers

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Abstract. The occurrence of airplane accidents in the air and on the ground, level is very phenomenal and the main reason to such incidents is human error, the errors and mistakes of pilots, air traffic controllers, crew members, ground handling crew etc. This research is mainly focused on the fatigue of Air Traffic Controllers and the detection fatigue levels of Air Traffic Controllers to ensure the Aviation Safety and Security. This research is followed by an implementation of a system for fatigue detection of Air Traffic Controllers for the Civil Aviation Authority Sri Lanka (CAASL) with the guidance and technical support of the Aeromedical and Aeronautical Units of the Civil Aviation Authority Sri Lanka. This system consists of a CNN model to capture the face of the Air Traffic Controller in order to detect the alertness and followed by a standardized questionnaire to detect the fatigue level of the Air Traffic Controller. The testing and evaluation of the system was done with the involvement of 50 currently working Air Traffic Controllers.

***Keywords*:** *Deep Learning, Convolutional Neural Network, Fatigue Detection*

Health Prediction and Monitoring with the use of Electronic Medical Records (EMR)- A Review

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Abstract. As the number of people in the world has grown, the need for electronic medical records has increased because large volumes of information are generated in hospitals, and it can be difficult to handle these records physically. Electronic Medical records (EMR) have significantly impacted the healthcare field, providing better patient care by computerizing hospital records. EMRs facilitate the electronic entry, maintenance, and upkeep of medical information about patients over long periods, resulting in better patient care and safety. This review describes and compares various methods and techniques to determine the most accurate ways to diagnose and predict diseases using EMR. Model evaluation is conducted in this review using metrics such as accuracy, recall, precision, and F1-score to evaluate the performance of each model. These techniques were divided into Deep Learning (DL) Methods, Machine Learning (ML) Methods, and Rule-Based Methods by studying recently published publications. Among the methods discussed in the review, Machine Learning is frequently regarded as the best method for health prediction using an EMR. Furthermore, this review also outlines the benefits and drawbacks of using these various techniques and how they have affected the healthcare industry.

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

Home Garden base Ayurvedic Plant Identification System Using CNN: A Review

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Abstract. Ayurveda is one of the world's oldest medical systems which uses the natural ingredients offered by various plants to cure different types of illnesses. Since Sri Lanka is endowed with a wealth of plant resources, it is critical to correctly identify the ayurvedic herbs that can be employed as medicinal substances. The citizens of the country, especially the younger generation, are unfamiliar with these valuable plants. Also, because of the economic crisis, Sri Lanka is currently experiencing a shortage of medicine imports from other countries. Hence, implementing a system to identify the ayurvedic plants available in the home gardens will assist the general public to use them as a remedy. Much research has been done on plant identification systems, but very little research done on home garden-based ayurvedic plants. Therefore, this research is focusing on reviewing the existing plant identification systems, the technologies used and their limitations of those. The feasibility of using the latest technology, "Convolutional Neural Networks (CNN)" for plant identification is mainly investigated. The accuracy levels and the efficiency of the identification process of each method have been compared in order to select the best method for implementing a home garden-based ayurvedic plant identification system. It has been observed that a majority of studies utilizing Convolutional Neural Networks (CNN) have achieved an accuracy rate above 90%.

Keywords: *Ayurveda plant identification system, Convolutional Neural Networks, Machine learning, feature extraction*

Identification of the Software Development Methodology for a Home Garden Based Ayurvedic Plant Identification System using CNN

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Abstract. There are several software development methodologies in the current world. In order to manage and have an efficient process throughout the software project, it is required to follow a proper software development methodology. The software development method should be selected after considering which software development methodology would work best for the project. Every methodology has its own set of strengths and weaknesses. This study is focused on selecting the best-suited software process model for a plant identification system using machine learning techniques such as CNN. The proposed system to be developed is a home-garden-based Ayurvedic Plant Identification System. It is capable of identifying the Ayurvedic plant's available in-home gardens and providing the user with valuable information such as the medicinal values and the areas where the plants can be found. This project involves technologies such as convolutional neural networks (CNN), image processing, and machine learning. This study has determined that the Agile method is the most appropriate software development life cycle for this project.

Keywords: *Software Process, Plant Identification System, Software Development Methodology*

A Comprehensive Review on Suitable Image Processing and Machine Learning Technique for Disease Identification of Tomato and Potato Plants

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Abstract. Agriculture is essential to Sri Lanka's economic development. It is vital to develop some new strategies in order to uplift the agricultural sector of Sri Lanka. Among the different vegetable crops cultivated in Sri Lanka, tomatoes and potatoes have a higher export value and are easily grown in many parts of the country. The major issue faced by the Sri Lankan vegetable cultivators is that there is no proper mechanism to identify the type of diseases infected on the vegetable plants and moreover there is a lack of knowledge on the solutions to be applied in order to protect the vegetable crops from being destroyed. Human experts continue to perform the traditional inspection of vegetables in Sri Lanka. It is a time taking and labour-intensive task.

In order to come up with a solution for this issue a system needs to be developed to identify the type of diseases that infected potato and tomato plants and provide the necessary solutions to be taken in order to protect the vegetable crops from being destroyed. Moreover, the system should update the types of diseases that infected tomato and potato plants on a map of Sri Lanka, based on the area of cultivation throughout the country. This will help other vegetable cultivators to be aware of the diseases most common in their area of cultivation and take appropriate precautions. Features such as shape, colour, and size can be extracted from an image of any vegetable plant to identify the type of disease infected. The aim of this research is to find the most suitable machine learning algorithm and image processing technique to be used in the proposed system.

Keywords: *image processing, machine learning, plant disease identification*

Identification of related technologies associated with Asthmatic Wheeze Detection Systems - 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. According to studies done by the Asthma and Allergy Foundation of America (AAFA) for the year 2019, this ailment affects Americans of all ages in the US. Asthma claims the lives of 11 Americans on average each day. According to the most recent study done by the Asthma and Allergy Foundation of America (AAFA), 4,145 persons with asthma will pass away in 2020. 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 to support developers while considering the accuracies of those systems. After studying these technologies has been identified that Convolutional Neural Networks can be used to develop this kind of system due to their high accuracy of it. The suggested approach accurately recognizes wheezing characteristics in a lung sound using canonical correlation analysis. Because these systems deal with patient lives, accuracy should be a top priority while building them. As a result, applications are carefully evaluated in light of these factors. Future research on systems related to other respiratory sound detection and classification techniques in the medical field will be very helpful because this study mainly focused on systems used for wheeze detection.

Keywords: *chronic obstructive pulmonary diseases, asthma, wheezing, convolutional neural networks, canonical correlation analysis*

Software Engineering

Software Engineering

Technical Session Chairs

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Technical Session II	*Ms. SCMDS Sirisuriya*

A Review of Highway Bus Arrival Time and Route Prediction System

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Abstract. With busy schedules and lifestyles, people don't have time and energy to waste unnecessarily. That is one of the main reasons people tend to use highway buses more than normal buses these days. In this case, waiting for buses to arrive at certain destinations is not convenient and sensible. Passengers who use buses should have a rough idea about the buses including the live location and the arrival time. This can also be applied to highway buses. A passenger who uses a highway bus must have an idea about 'when the bus arriving' and 'where is the bus at this moment. Bus transportation plays an important role in reducing fuel consumption, private vehicle usage, and traffic congestion. The ability to obtain accurate predictions of buses at a certain location on a real-time basis is important for the bus passengers and the operators. Predicting the arrival time of a bus at a certain location is challenging. To reduce the long waiting time and reduce the inconvenience faced by bus passengers, it is essential to accurately predict the arrival times of buses. With the development of technology, a large number of systems have been developed to overcome this challenging yet important task. In this paper, a large number of literatures have been reviewed and analysed for bus arrival time, route prediction, and live location tracking. The review was done with the help of recent studies that have been conducted in this area. Artificial neural network (ANN), Deep neural network (DNN), and support vector machine (SVM) models were identified as some of the techniques that can be used to predict the arrival time. In addition to that, it was observed that statistical models such as regression models and historical data-based models can also be used in order to predict the arrival time. At the end of the review, it was identified that machine learning approaches such as ANN models and DNN models are the most suitable approaches that can be used to predict the arrival time of the bus at a specified location due to the accuracy of the results and the performance. GPS devices attached to the bus, Google map API, Geolocation API, and android smartphones that can track the location of the user are the methods that can be used to track the live location of the bus at any moment according to the review. Lastly, the haversine algorithm was identified as the most suitable algorithm that can be used to find the nearest bus station from the user's current location.

Keywords: *arrival time prediction, location tracking, the nearest location, neural networks, GPS, haversine algorithm*

A Review of Product Price Comparison System Based on Sri Lankan Supermarkets

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Abstract. The number of e-commerce websites increases along with technological advancements and the expansion of e-commerce, but at the same time, it has gotten more challenging for customers to select the best offers from these websites. Data must be filtered and compared with them independently. Even if a lot of work has been put into it, there is still a chance that the outcomes may be ambiguous. In light of the fact that internet prices are updated once or more frequently and there are a large number of product offers available on the internet, automated processes are required for identifying, collecting and comparing price information. People will benefit from it if a comparable system of product prices is developed for supermarkets to use. They are able to get the items at the most affordable price, and they will not be uninformed of the most attractive deals that are offered on supermarket websites. Also, people have made their lives easier since they do not have to wait till a specific time or location to accomplish their shopping because they can shop online at any time and from anywhere. This has resulted in people being able to complete their shopping more quicker. These reasons lead to the design of a product price comparison system that lets users enter their grocery list or a single product, and the system calculates the total price for the grocery list for all supermarkets in their area. Users can then easily locate the supermarkets with the lowest prices and do their shopping at those supermarkets. This system will use web scraping to retrieve product details from the web and then filter and store the filtered data in a database as needed. For filtering and accelerating search results, an indexing-like method will be used.

Keywords: *Web scraping, Price comparison, Web crawling, E-commerce*

A Review of Machine Learning Frameworks on Venture Capital Investments

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Abstract. Venture capital investors are the investors who are investing in start-up companies in order to help them to scale up their companies. This study mainly focuses on reviewing the existing Machine Learning (ML) models designed for venture capital investments. The aim is to compare the accuracy levels of different types of ML algorithms which have been used to evaluate start-up companies. To conduct this review, 11 existing research studies were chosen, and those studies were analysed carefully in order to filter the necessary data and information. Studies which were carried out in the time periods 2016-2021 have been considered in order to gather information. The accuracy levels of each ML algorithm have been plotted after carrying out a thorough study. After analyzing the results, it was evident that various algorithms have performed with different accuracy levels. But two specific algorithms namely Gradient Tree Boosting and Heterogenous algorithms have been able to show higher accuracy levels and call-back rates. Therefore, it has been concluded that Gradient Tree Boosting and Heterogeneous algorithms are the most suitable ML algorithms to implement a start-up evaluation model.

Keywords: *Venture Capital Investments, Machine Learning Model, Machine Learning Algorithm, Start-up*

A Review of Deep Learning-Based System for Automatic Detection of Obstructive Sleep Apnea in Adults

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Abstract. Obstructive sleep apnea is a most common sleep disorder characterized by irregular breathing cycles or periods of difficulty breathing while asleep. Obstructive Sleep Apnea (OSA) is the most prevalent kind of condition. It is primarily divided into central, mixed, and obstructive sleep apnea. Although it affects people of all ages, older people are the most frequently affected. OSA significantly alters the typical sleep pattern, which causes many heart-related issues. Polysomnography (PSG) is the conventional technique of identifying sleep disorders; however, over the past several decades, many alternatives have been proposed to replace conventional methods due to their complexity and time commitment. This study aims to determine the best approach for the Deep Learning-Based System for the Automatic Detection of Obstructive Sleep Apnea and to evaluate existing approaches that still need to be implemented in software. For this study, it was determined that EEG-based hybrid techniques(classifiers) are suitable by conducting a survey and a review of the state-of-the-art methods for OSA identification.

Keywords: *Obstructive Sleep apnea, EEG, ECG, Deep Learning*

Identifying a Software Process Model for Book Tracking System for Books Available in Bookstores

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Abstract. Different software development life cycle methodologies have different phases and activity flows. Each method has distinctive qualities that both directly and indirectly influence the outcome. This research focuses on choosing the best methodology to create the book tracking system for books available in bookstores. Through this paper, several Software Development Life Cycle (SDLC) methods are discussed as well as how this project works under those methods. Finally, it is intended to identify the method that suits the proposed system.

Keywords: *Software Development Life Cycle method, Book Tracking System, Bookstores, Book Availability*

A Review on Automatic Number Plate Recognition (ANPR) Systems

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Abstract. Automatic License Plate Recognition (ANPR) systems have been a significant area of study in image processing and monitoring systems. Automatic number plate recognition systems keep track of vehicles, which is extremely difficult to manage manually. The video analysis of the captured number plate image relies heavily on character recognition and computer vision algorithms for plate recognition. This type of vehicle identification has been a focus of research for more than a decade. To read license plates, automated number plate recognition systems use optical character recognition (OCR) in conjunction with various image processing techniques. Computer vision-based systems, are the most accurate and widely used systems. The techniques used in these systems are designed to improve the performance, cost-efficiency, scalability, and accuracy of number plate recognition software. These ANPR systems use a variety of techniques, including computer vision. These techniques include real-time object detection, image processing, optical character recognition, template matching, and others. The captured image of the vehicle number plate is processed through many steps in an ANPR system, and as a result, it recognizes the numbers and letters of the specific vehicle number plates.

Keywords: *ANPR, Computer Vision, Optical Character Recognition, Image Processing*

A Comparative Study on Centralized Solution for Bookstores

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Abstract. Today, it is possible to achieve the tasks encountered in everyday life very systematically and easily using new technologies. People now place more demands on the effectiveness and quality of their lives. Because it directly affects people in the process of improving their quality of life. As a result, it is important to improve the quality of reading books which are very helpful in improving the spiritual development of a person as well as mental freedom. People who are interested in books are focused on easily finding a place that has a book of their choice. It is fact that frequent book buyers know that it is not easy to find the exact places where books are available at the lowest prices. Along with this, some important information was revealed through a survey. One of the findings of this survey was that many people still go to bookstores to purchase books instead of ordering books online. Another finding was that there is a special interest in award-winning books, old famous books, best-selling books, and newly released books when selecting books. One of the main findings of this survey was that there are problems such as the unavailability of books, missing out on discount opportunities, and difficulty finding the bookstore with the best deal/discount. This survey also found that if there is a way to avoid these problematic situations, it will be very easy for book buyers. A solution to overcome these problems is to develop an online book-tracking system for book lovers. Here, the emphasis is mostly on the location of the book you're looking for and the underlying context in relation to constructing an intuitive platform to find a book at the lowest price and with the greatest discount. The main purpose of this paper is to identify the most efficient and effective way for someone who is going to buy a book from a bookstore. This research paper proposes a new method to develop an application that provides a novel convenience for book lovers.

Keywords: *Web Scraping, Book Tracking, Bookstores, Books*

A Review of Technologies Adopted in Event Management Systems

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Abstract. The procedure of planning and conducting an event is known as event management. Now, the world is transitioning to a technological future where everything we want is available online as technology advances quickly. Because of that, the easiest method to keep customers interested in the services when they are on the go is to use an online system for managing events. For event management, there are a lot of existing event management systems are there. However, there is no centralized system to manage the events in Sri Lanka. So, this research work's primary goal is to evaluate various existing systems and initiatives. This leads to identifying the technologies, methodologies, and features used and identifying failures in those systems. Here, we used two [primary and secondary] methods to select, review, and gather the information. The review results convey that most existing systems are created with Android Studio, and the SQL database will be used to manage the back end. Furthermore, we conclude that creating a new intelligent event management system in Sri Lanka is beneficial for managing events easily and efficiently.

Keywords: *Events, Event Management, Smart Event Management, Technologies, Tools*

Classification of The Different Technologies, Functions and Usability of Blood and Organ Donating Applications – A Review

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Abstract. Blood and organ donation is a critical healthcare requirement in Sri Lanka. The one and only way are to take another matching person's blood and give them to the required person. When it comes to organ donations, modern scientists try to make artificial organs. But there are not highly recommended and the cost for those is very high. The most practical and present practising way is taking another matching person's organ and transplanting it to the patient. Because of this reason in present society, there is so much organ trafficking. There are various kinds of blood and organ donation applications that are helping to increase the well-being of human life. But most people are not aware, and they are scared to use these kinds of applications. Therefore, this review study contains technologies of that kind of system, their features, and usability, and the aim of this review is to make a brief classification among those technologies, functions, and usability of the blood donation applications. The main objective of this review study is to support the developers to find suitable technology for the further development the blood donation applications. This research study followed the currently progressing applications and proposed systems that have not been implemented yet. Selected applications represent different regions; some have used the same technology and combined several technologies. Applications are reviewed critically according to these aspects. According to the researchers' blood donation applications need security, and they need to be highly reliable in every situation. Also, the interfaces should be user-friendly. The data gathering has to be reliable. The matching of the blood groups has to be reliable.

Keywords: *gamification, blockchain, haversine*

Review Paper on Vessel Planning Algorithms and Technologies

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Abstract. In the context of the marine transportation system, and per recent records and statistics, large container terminals whole over the world proceed with more than 30 million container moments throughout the year. In container transportation there are major factors to be considered as any inaccurate data or calculation may be caused huge losses. In the field of vessel loading the job is done by vessel planners who have the technical knowledge and experience about it. we investigate the stowage-planning problem of organizing containers on a container ship. When a container that needs to be emptied at the current port is stacked underneath a container that needs to be unloaded at a later port along the ship's route, shifting temporary unloading and reloading of containers is inevitable. And it is done via the physical involvement of vessel planners and experts. As per the studies, we identified research findings as mathematical algorithms used to manually plan vessels. And the incidents that happened in the past enhance the advantages and disadvantages of prevailing vessel planning conditions. We have followed the PRISMA methodology by referring to research papers on this area and extracting the key technology and mechanism they have used to plan a vessel. The goal of the stowage planning problem investigation literature survey is to reduce the amount of time needed for crane and shifting movements during a container ship tour while preserving the ship's stability. Here we tried to study previous studies on a solution technique with a prediction for the issue. This will provide precise data as a study or pattern for loading a ship from a port of origin to make the fewest possible cargo shifts, cut down on terminal waiting times, and ensure the crew's and ship's safety.

Keywords: *vessel planning, stowage planning, shifts, heuristic algorithms, containerships*

A Systematic Review on Blockchain-Based Ridesharing System

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Abstract. A Ridesharing market has surged massively in recent years as it enables riders to share rides among other participants, dividing the fare among each other. It further is valuable in the reduction of traffic jams and carbon emissions to the environment. Due to the centralized architecture of the current ridesharing system, major concerns such as privacy issues, lack of transparency, and vulnerability to malicious attacks have emerged through the years. The trust of the system solely depends on the third party and hence it can be vulnerable to a single point of failure and Denial-of-Service attacks. As a solution, many studies relating to blockchain technology have been conducted. This paper presents a systematic review of existing blockchain-based ridesharing architectures and proposals. Suitable studies were initially selected by utilizing a rigorous searching mechanism and they were analysed by quantitative and qualitative methods. The results reveal that blockchain provides security and transparency with the use of smart contracts but also consists of scalability, overhead and safety issues. Ethereum platform is preferable for deployment as it provides smart contracts accessibility and can be tested with ease. Furthermore, a reputation system would aid in enhancing the safety and trust within a ridesharing system.

Keywords: *blockchain, ridesharing, peer-to-peer, decentralized, Smart Contracts*

A Review on Fake News Detection using Machine Learning Techniques

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Abstract. Advances in the information and technology sector have increased the number of individuals who use the Internet on a regular basis for a variety of purposes. As a result, the popularity of social media platforms has grown. While there are numerous advantages, there are also downsides because of the high usage of social media platforms that causes major problems. The propagation of fake news through those platforms is a major problem that must be addressed by taking the appropriate efforts to detect fake news and limit or reduce its dissemination. As a result, research into the identification of fake news has gained traction in recent decades and machine learning algorithms and models have been shown to be effective and successful in the detection of fake news. The purpose of this study is to give a thorough literature review on twelve widely used algorithms by examining prior research works on each technique. This study aims to give a better understanding and support for future research by analyzing existing work to determine which techniques perform well based on characteristics such as the type of news and the dataset used to train the model. Through this study, it was evident that there are a variety of different approaches that have been used to detect fake news and there are many different types of fake news that require different types of detection techniques. The reviewed literature elaborates that combining algorithms improves performance and produces more accurate predictions. Some research show that the linear-based classifiers achieved better results than the nonlinear ones. Further research can be developed to test the effectiveness of techniques against new and different datasets as there are considerable changes in performance based on the data set used for training and to develop models that could work with all types of news.

Keywords: *machine learning, fake news detection, classification algorithms, hybrid models*

Computer Engineering

Computer Engineering

Technical Session Chairs

Technical Session I	*Dr. B Hettige*
Technical Session II	*Prof. Sudha Buwaneshwari*

Prevention of Foot Ulceration in Diabetes Patients using Foot Plantar Pressure Mapping Insole System: A Short Review

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Abstract. A major global health concern, diabetes mellitus affects 415 million adults globally. Diabetic foot ulceration (DFU) is one of the most life-threatening complications of the condition and can result in amputation. Applying excessive pressure to specific areas of the foot is among the main causes of foot ulcers. Using an In-sole plantar pressure mapping system embedded into a shoe, people with diabetes can identify high-pressure points earlier and can take relevant medical actions before it gets too serious. A plantar pressure mapping insole system has the potential to be extremely important for the diagnosis, care, and behaviour change of diabetic patients. Analysis of this research review shows the lack of portable methods to measure plantar pressure dispersion. To full fill the gap in this research area, the research aim is to develop a plantar pressure mapping insole system that can detect high plantar pressure points. This paper reviews the aids, methodology, applications, and justification for an in-shoe plantar pressure mapping insole system. The results of this study indicate that different foot plantar pressure mapping sensors can be used to develop the planter pressure mapping insole system. In addition, this study also found the preference of diabetes patients when it comes to the usability and efficiency of the insole system.

Keywords: *Plantar Pressure Mapping Insole, Diabetes, Foot Ulceration*

RSSI and Machine Learning-Based Localization System for Smart Cities: A Short Review

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Abstract. The Internet of Things (IoT) is being widely used to reduce costs and enhance performance across a variety of application areas. Localization-based services are also included in these varieties of applications. When a sensor node is localized, it can be identified by its geographical location within an IoT network. Most localization mechanisms use a Received Signal Strength Indicator (RSSI), which measures the strength of the received signal from the sensor nodes, along with supervised Machine Learning (ML) algorithms. Location-enabled Internet of things (IoT) has attracted a lot of attention in scientific and business communities because of its importance in agriculture, wildlife management, and infectious disease control. It is important that location information be accurate and frequent for these applications to be successful. This paper consists of a review of RSSI and Machine learning Based Localization Systems. It focuses on four main IoT application domains: smart cities, smart transportation, smart healthcare, and smart manufacturing. It demonstrates the technologies, as well as the important factors influencing the current systems.

Keywords: *Localization, Smart Cities, RSSI, Machine Learning*

A Robotic Approach to Design an Automatic Marionette Puppet Theatre: A Feasibility Study

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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 don't 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. 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 counties as well.

Keywords: *Puppetry, Robotics, Marionette, Puppet Theatre*

A Comparative Study on Unmanned Vehicle for Human Tracking using Face Recognition System: A Review

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Abstract. Similar to pursuing a criminal or looking for a missing child or senior in a crowded area, surveillance is challenging. This review's objective is to offer a solid resolution to the issue. This issue is not clearly resolved in Sri Lanka. Operating autonomous vehicles equipped with facial recognition software is the concept. Over the past few decades, there has been a sharp increase in interest in facial recognition theory and algorithms. Video surveillance, criminal identification, building access control, and driverless and self-driving vehicles are just a few of the specific applications gaining momentum in the industry. Numerous methods have been created, including regional, all-encompassing, and hybrid ones that describe facial images using either a few facial image elements or the complete face feature. Technology advancements have made it possible to create unmanned systems and vehicles for use in the air, on land, and underwater. Unmanned platforms continue to be the focus of various studies and research contributions as their array of applications grows regularly. A person's face (whether they are banned or missing) is first entered into the system, after which a car drives across the area looking for the face until one is found. Send a live notification and the person's location if they are located. This project's use can be broadened to include pattern monitoring, public security surveillance, and observing individuals in enclosed areas like exposition halls. With unmanned vehicles, we can do our tasks quickly and with little manual labour. This white paper explains how sensors and measurements let autonomous human-tracking vehicles with facial recognition algorithms operate correctly.

Keywords: *Unmanned Vehicle, Facial Recognition, Surveillance, Robotic*

Implementation of a Bitcoin Mining System Using Single Board Computers (SBC): A Review

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Abstract. Cryptocurrency, often known as digital currency, is a distributed and public ledger system that makes use of encryption to strengthen the security of financial transactions. To run a profitable Bitcoin mining operation, you will need a sizable number of hash functions, which in turn demands a powerful mining rig. In this piece, we will demonstrate how to install a cryptocurrency miner on your computer using a Raspberry Pi computer, some USB hash miners, and CG-Miner software running on the operating system of your choice. The Raspberry pi achieves a high level of interoperability, and its exploration of new frontiers is aided by its portable nature. This is because it provides a platform that is based on a System on a Single Chip (SoC). The mining industry's exponential growth has resulted in increased demand for cryptocurrency mining, which has resulted in the creation of a new technology that is both cost-effective and energy-efficient, and it was created in response to this need.

Keywords: *Cryptocurrency, Bitcoin, Raspberry Pi, CG Miner, Hashing*

Comparative Study of Blind Support Devices: A Review

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Abstract. Education is the foundation of life. To educate there are many activities to be done. Visually impaired persons experience many barriers to education including inaccessible information from the environment and require support from another to overcome those. To educate mental stability is essential. Travelling from one place to another and obstacle detection is another key challenge faced by visually impaired people. Person identification like mother and father, money identification is another difficulty faced by these people. To overcome those various existing systems available now. But they are in a high price range which cannot be accepted by middle-class people. Blind support devices began with the white cane. In Sri Lanka, there is no that kind of solution to reading or writing in Sinhala for a blind person. Google glass is the newest technology for visually impaired devices, but it is over 1200$. Using a survey found that most blind people want to do their work individually. This paper presents a comparative review of existing blind support devices and a survey on function, method of warning, and place of wearing. According to the survey most of them like head-mounted devices and voidable warning methods. Using this Survey and comparative study gives proposed solutions for these blind persons.

Keywords: *Smart Specs*, *Sensor*, *Survey-Based*, *Technology*

Applications of UAV in Precision Agriculture: Applications and Challenges

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Abstract. The production of food becomes a very important factor in feeding the population on this planet. Rather than that, agriculture gives several benefits to the country, including food and nonfood products, transportation, and environmental balance. The need for food security puts pressure on decision-makers to guarantee that our globe has enough food for everyone. Thus, the use of an Unmanned Aerial Vehicle (UAV) is an option for efficiently managing a farm to maximize its productivity. This study gives knowledge of the use of UAVs and their applications in agriculture to encourage the use of UAVs in agriculture and support their sustainability. The purpose of this paper is to examine the use of UAVs in agricultural applications. In recent years, intelligent sensor techniques have achieved significant attention in agriculture. It is applied in agriculture to plan several activities and missions properly by utilizing limited resources with minor human interference. Currently, plant cultivation using new agricultural methods is very popular among growers. However, aeroponics is one of the methods of modern agriculture, which is commonly practised around the world. Most wealthy nations now use Unmanned Aerial Vehicles (UAVs) and cutting-edge technology like Photogrammetry and Remote Sensing and Precision Agriculture to create healthy farms with less disease. The farmers will benefit from increased crop quality and production as well as, most critically, reduced costs, and workload. Additionally, it can be used to spray herbicides and fertilizer. To track the health and height of the crops, UAVs are frequently built with an autonomous drone system equipped with sensors and cameras. There are several UAV model kinds that have been produced. This paper will discuss the applications and challenges of unnamed aerial vehicles in the agricultural sector.

Keywords: *UAV, Agriculture, Applications*

Hardware Accelerator for Blockchain-Based Applications in IoT Devices: A Review

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Abstract. A growing number of Internet of Things devices are contemplating the usage of blockchain technology mainly due to various privacy and security concerns. Blockchain can be used in the IoT sector for making data tamper-proof while sharing between devices, storing sensitive data in a decentralized manner, and using smart contracts in blockchain to trigger various events upon meeting certain conditions. There are also other use cases such as asset tracking, supply chain tracking, and integration with machine learning algorithms. Since participation in blockchain protocol is required for those use cases, it necessitates dedicated computational capabilities of the underlying devices. This is an inherent challenge in an application domain infamous for having many, often strict, resource limitations such as computational power and area. This study focuses on the SHA256 hash function, a major component of blockchain technology, as well as hardware accelerators for the SHA-256 hash function and critically reviews key literature in this research area. The results in this review demonstrate how hardware accelerators can be used to overcome various limitations in IoT devices, providing low-power devices with the computational power needed to complete demanding tasks such as participating in blockchain protocols. It also demonstrates a performance comparison of existing implementations regarding throughput, power consumption, and area, as well as the advantages and disadvantages of each approach.

Keywords: *SHA-256, Blockchain, IoT, Cryptography, Hash Function, Hardware Accelerator, FPGA*

Indoor Positioning Systems for UAV Localization: A Review

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Abstract. In modern technologies, mini unmanned aerial vehicles (UAVs) are taking a major part. But most of the time it is a huge problem to detect the location of UAVs in indoor environments. This is a review of studying Indoor Positioning Systems for UAV Localization with several technologies. These days, indoor localization of Mini UAVs employing wireless technology is crucial for both military and civilian purposes. Here, it tries to offer a thorough analysis of localization methods employing the most widely used wireless technologies. In circumstances when indoor GPS is unavailable, UAV localization often depends on vision-based methods combined with mechanical sensing, such as a visual navigation system or simultaneous localization and mapping (SLAM) using 2D/3D cameras or laser optical viewfinders. This work compiles many studies and solutions for localizing Mini UAVs in interior settings and the results of a survey done with an example which relevant to this topic.

Keywords: *UAV, Mini UAV, Indoor Localization, Signal Processing, IoT, Wireless Communication, Wireless Positioning*

Sensor-based Fully Automated Component for Fan: A Review

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Abstract. Energy crisis can be considered as a big crisis in the world today. It will have a big impact on third world countries like Sri Lanka. As a result, we have to bear huge cost for electricity. Therefore, many people have paid attention to using electricity sparingly and reducing electricity consumption. To find a solution to the electricity crisis, this review paper discussed the impact of electric fans on electricity consumption in homes and offices and measures that can be taken to reduce them. For that, using the technology that is rapidly evolving in the world today, a fully automatic profitable device based on sensors can be proposed for electric fans as a solution. The device proposed here is expected to perform basically two functions. The first one is to control the fan on/off by human detection instead of manual switching of the system. The other function is to control the fan speed according to temperature changes. Finally, the purpose of this proposed design is to increase user comfort and reduce energy consumption.

Keywords: *Sensor-based Automation Systems, Smart Devices, Motion Detection*