



General Sir John Kotelawala Defence University  
Sri Lanka



# ABSTRACTS

Computing for Professional Excellence through Collaboration

## 11<sup>TH</sup> INTERNATIONAL RESEARCH CONFERENCE

Securing Professional Excellence through Collaboration

13<sup>th</sup> - 14<sup>th</sup> SEPTEMBER 2018



This book contains the abstracts of papers presented at the 11<sup>th</sup> International Research Conference of General Sir John Kotelawala Defence University, Ratmalana, Sri Lanka held on 13<sup>th</sup> - 14<sup>th</sup> September 2018. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form, without prior permission of **General Sir John Kotelawala Defence University, Ratmalana, Sri Lanka**

Published by  
General Sir John Kotelawala Defence University  
Ratmalana 10390  
Sri Lanka

Tel : +94113370105  
E-mail : chair.irc2018@kdu.ac.lk  
**Website : [www.kdu.ac.lk/irc2018](http://www.kdu.ac.lk/irc2018)**

ISBN978-955-0301-51-5  
Date of Publication  
13<sup>th</sup> September 2018

Designed and Printed by  
[www.designwavesmedia.com](http://www.designwavesmedia.com)

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# Content

Page	
9	<b>Message from the Secretary to the Ministry of Defence</b>
10	<b>Message from the Vice Chancellor</b>
11	<b>Message from the Conference Chair</b>
12	<b>Message from the President of the Session</b>
	<b>Plenary Session Abstracts</b>
14	<b>Role of Data Science in Digital Transformation of Public Sector</b> Prof Terrence Perera
15	<b>Introducing STEM Education in State Schools Across Sri Lanka</b> Prof Ashu Marasinghe
16	<b>Engineering High Performing Systems</b> Dr Malith Jayasinghe
17	<b>Artificial Intelligence for National Development: Addressing Real World Problems</b> Dr HL Premaratne
	<b>Technical Session Abstracts</b>
19	<b>Rice Yield Estimation Using Free Satellite and Field Data</b> TL Dammalage and T Shanmugam
20	<b>Software for Complex Process Automation and Stakeholder Relationship: State-of-The-Art in HydroGIS Tool for Urban Flood Management</b> RMM Pradeep and NTS Wijsekera
21	<b>New Customers Churn Prediction Model for Mobile Telecommunication Industry</b> HI Arumawadu, LLG Chathuranga, and RMKT Rathnayaka
22	<b>Impact of Big Data and Political Microtargeting on Donald Trump's 2016 Presidential Campaign</b> N Singh and A Wijegunawardhana
23	<b>Predicting the Risk of Being a Diabetic Patient Using Statistical Analysis and Data Mining</b> BPN Perera, BTGS Kumara, and HACS Hapuarachchi

# Content

Page

- 24** **Parallel Queue Optimization through Computer Aided Simulation and Queueing Theory: A Case Study on Matta Canteen of Sabaragamuwa University of Sri Lanka**  
S Anujan , K Banujan, MS Karunarathne, and KPN Rukshan
- 25** **Artificial Neural Network Based New Classification Methodology for Identifying Kidney Disease Risk Levels**  
KAA Chathurangi and RMKT Rathnayaka
- 26** **A Machine Learning-Based Solution for Finding Perfect Marital Partner**  
BKTP Wickramasinghe, DU Vidanagama, and N Wedasinghe
- 27** **Cloud-Based Power Consumption Estimation for Electric Vehicles**  
PGHLR Fernando and PPNV Kumara
- 28** **Water Intake Recognition System Based on Pressure Sensors and Bluetooth Technology**  
MAJ Wjesequera and WPJ Pamarathne
- 29** **Method to Enhance Features of Biometrics Security Management and Fingerprint Identification using Low-Quality Images**  
RSW Arachchi and RL Dangalla
- 30** **Knowledge Sharing System for Dental Extraction in order to Assist Dental Doctors and Assistants**  
K Banujan and S Vasanthapriyan
- 31** **Automated Prediction of Customer Hotspots to Taxi Drivers Using Clustering Techniques and Web Scraping**  
SPDT Saranatha and PPNV Kumara
- 32** **Image Processing Based Automatic PELICON Crossing System**  
K GK Chathumini, BTGS Kumara, and HACS Hapuarachchi
- 33** **A Novel Elliptic Curve Based Multi-Key Encryption Method for Multicasting Single Content with Access Control**  
TMKK Jinasena, RGN Meegama, and RB Marasinghe
- 34** **Artificial Intelligence Approaches for Improved Adaptability in an Adaptive e-Learning Environment: A Review**  
KG Hewa and PPNV Kumara
- 35** **Fostering Social Engineering Awareness: Proactive Model**  
HAHV Halwatura, WGCI Priyadarshana, and T Samarasinghe
- 36** **Personalized Travel Spot Recommendation and Guidance System for Sri Lankan Tourists**  
C Shiranthika, N Premakumara, JP Weerawarnakula, H Lakmal, S Fernando, and S Sumathipala

# Content

Page

- |                             |   |
|-----------------------------|---|
| <b>37</b>                   | <b>Web, Mobile and Computer Accessibility: Issues Faced by the Sri Lankan Visually Impaired Community</b><br>N Wedasinghe, NT Sirisoma, and APR Wicramarachchi  |
| <b>38</b>                   | <b>GPS Based Safe Location Guiding Android Systems in Case of Tsunami</b><br>RVC Tharanga and RMM Pradeep   |
| <b>39</b>                   | <b>Impact of Adoption of Homomorphic Encryption: Security Enhance Guideline For Sri Lankan Military System</b><br>RMKDLB Abeykoon, RT Udara, GAD Ganepola, WAAM Fernando, RPS Kathriarachchi, and DU Vidanagama |
| <b>40</b>                   | <b>An Efficient Web Enabled Automatic Emergency Medical Assistance System Using Android</b><br>UDVA De Silva, HRWP Gunathilaka, and N Wedasinghe  |
| <b>Poster Presentations</b> |   |
| <b>42</b>                   | <b>Adaptive Solution for Key Challenges in Internet of Medical Things</b><br>RMPHK Rathnayake and M Sajeewani Karunaratne   |
| <b>43</b>                   | <b>Analysis and Development of Mess Management System for the KDU Cadet Mess</b><br>ODS Fonseka , RL Jayakody, PHP Arachchi, and SCM de S Sirisuriya  |
| <b>44</b>                   | <b>Emergency Alert System for Reporting Crime Issues to Nearest Police Station</b><br>LC Wijenayaka and N Wedasinghe  |
| <b>45</b>                   | <b>An E-Commerce Web Application for Agricultural Development in Sri Lanka</b><br>RL Jayakody, DMR Kulasekara, and ADAI Gunasekara  |
| <b>46</b>                   | <b>Safe Accident Alert System for Reporting Accidents to Nearest Hospital and Police Station</b><br>GSA De Silva, SCM de S Sirisuriya, and RMM Pradeep  |
| <b>47</b>                   | <b>A Software Solution for Image Identification and Artistic Skills for Visually Impaired People using Braille</b><br>ODS Fonseka and N Wedasinghe  |
| <b>48</b>                   | <b>A Review on Data Mining Techniques to Predict the Student Performance and Decision Making in Educational Institutions</b><br>KG Abeywickrama, WJ Samaraweera, and CP Waduge                                  |

# Content

Page

- |           |   |
|-----------|---|
| <b>49</b> | <b>Data Security System for Chat Applications Using Cryptography, Steganography and Image Processing</b><br>SC Mataraarachchi and N Wedasinghe                    |
| <b>50</b> | <b>Workers' Alcohol Detection and Prevention System</b><br>KC Yakupitiya and HRWP Gunathilake   |
| <b>51</b> | <b>Fast and Accurate Palm-Print Recognition System for Low-Quality Patterns</b><br>EAIL Edirisinghe and RL Dangalla   |
| <b>52</b> | <b>Smart Tea Leaves Disease Analyser: Mobile Based Disease Detecting and Solution Providing System</b><br>VS Dahanayake, WJ Samaraweera, and DMR Kulasekara       |
| <b>53</b> | <b>Hairstyle Recommendation Based on Face Shape Using Image Processing</b><br>SV Rajapaksha and BTGS Kumara   |
| <b>54</b> | <b>Consistency in Multiplayer Online Game in Continuous Domain</b><br>HPAI Pathirana and RMCAB Rathnayaka   |
| <b>55</b> | <b>Requirements for an English-Sinhala Smart Bilingual Dictionary: A Review</b><br>L Samarawickrama and B Hettige   |
| <b>56</b> | <b>A Review of Mobile Technology for Teaching and Learning Mathematics</b><br>VO Galahitiyawa and RPS Kathriarachchi  |
| <b>57</b> | <b>Personalized Recommendation System for Leisure Time Activity Using Social Media Data</b><br>M Ramashini, DP Jayathunga, A Gowthamy, N Rammiya, and U Kiruthiga |
| <b>58</b> | <b>Data Handling and Maintaining Data Consistency in Scalable Replicated Micro-Services</b><br>WMNKGTL Weerakoon and BTGS Kumara                                  |
| <b>59</b> | <b>A Web Based Paperless Meeting Management System</b><br>MPL Perera and DU Vidanagama  |
| <b>60</b> | <b>The Rashomon Effect on Software Development Requirement Gathering Process</b><br>I de Silva, BMTN Rathnayaka, and M Wickramatunga                              |
| <b>61</b> | <b>IoT Based Falls Detection and Heart Attack Detection System for Adults: SMART Wearable</b><br>KKVS Anjana, RPS Kathriarachchi, and DMR Kulasekara              |

## MESSAGE FROM THE SECRETARY TO THE MINISTRY OF DEFENCE



It is with great pleasure that I am issuing this message to the International Research Conference 2018 of the General Sir John Kotelawala Defence University (KDU) as the Secretary to the Ministry of Defence and the ex-officio Chairman of the Board of Management, KDU.

I wish to place on record my sincere appreciation to KDU for playing a leading role in molding the future of the military as well as civilian youth who are in pursuit of high quality tertiary education in Sri Lanka. Today, KDU has gained recognition as an excellent seat of learning and disseminating knowledge that empowers attitudes and develops skills of the young graduates. It also contributes immensely to the much needed research and innovation.

KDU IRC is an annual event in its calendar eagerly anticipated by many due to the significance it holds in providing a platform for both local and

international intelligentsia to congregate, confer and disseminate knowledge. I am sure that, under this year's theme, securing professional excellence through collaboration, the conference will encompass a wide range of topics that are of utmost benefit for potential scientific and socio economic advancement in Sri Lanka.

While expecting to see great minds from all over the world meet and share their thoughts and knowledge at this event, once again I express my sincere appreciation to the Vice Chancellor and KDU staff for the enthusiasm and commitment shown towards making this scholarly experience a memorable one for its participants.

I wish that this international research conference would be highly productive for all participants – a conference that enriches the much needed research culture to ensure the nation's growth enabling to face its future challenges.

**Kapila Waidyaratne**  
President's Counsel  
Secretary

## MESSAGE FROM THE VICE CHANCELLOR



I am delighted that we have been able to organize the 11<sup>th</sup> International Research Conference of General Sir John Kotelawala Defence University (KDU IRC – 2018) conducted on the overarching theme, “Securing Professional Excellence through Collaboration” and convened over two days, 13<sup>th</sup> and 14<sup>th</sup> September 2018 at the university premises. Hence, it is with great pride that I pen down my thoughts on this Abstract Book of KDU IRC-2018.

KDU IRC-2018 is a world class forum that brings professionals and researchers of various disciplines to a common platform to disseminate their valuable research findings. They are able to present, discuss and deliberate their research findings with peers and experts, both local and international, as well as engage in lively discussions on contemporary matters. The resource personnel of the conference are eminent Sri Lankan and foreign researchers, academics and professionals with international recognition including those of our own staff at KDU.

We are proud to have internationally eminent, Sri Lankan born scientists, such as, Prof. Mohan Munasinghe and Dr. Sarath D. Gunapala, as guest speakers at the inauguration of the conference. They have made our motherland proud in the international arena as renowned experts and intellectuals in their respective fields. Further, this conference is enriched with the participation of many local and foreign academics in varied disciplines; along with personnel from the

tri-services and the police, thus making our conference the only research conference in Sri Lanka that brings together civilian professionals and their counterparts in security forces.

What is special about this conference is that the research papers are automatically uploaded to Google Scholar with H-Index Citations. The best papers are published in journals and others as proceedings. In addition, provision is given for live telecast of oral presentations through YouTube, and presentations on Skype, for international authors. The plenary sessions, pre/post-conference workshops and oral and poster presentations, would no doubt generate productive discussion and constructive criticism which would in return instigate thoughts for development in future.

I wish to record our gratitude to the Ministry of Science, Technology and Research and the National Science Foundation, not forgetting the Ministry of Defence, for their consistent support in co-organizing our conference, and my sincere appreciation of the academic and administrative staff of KDU together with our well-wishers for their invaluable contribution towards the success of this mammoth event.

Finally, I wish you, the presenters, good luck with your scholarly presentations at KDU IRC-2018 and the participants a memorable and thought provoking experience.

**JJ Ranasinghe VSV, USP, psc, MSc (DS) Mgt**  
Rear Admiral  
Vice Chancellor

## MESSAGE FROM THE CONFERENCE CHAIR



On behalf of the Executive Committee, I am honoured and delighted to welcome you to the 11<sup>th</sup> International Research Conference of General Sir John Kotelawala Defence University (KDU IRC-2018); bearing the theme, Securing Professional Excellence through Collaboration. Over the past 11 years, KDU IRC has grown to be a major international research conference, continuing with its tradition of high-quality and broad international participation in all areas of research. Hence, it is a pride and honour to preside over this prestigious research conference in Sri Lanka.

I am very pleased to welcome you to KDU IRC-2018 which is based on fundamental concerns to all scientists and non-scientists alike. This conference also enables the exchange and dissemination of useful information on multilateral initiatives. Therefore in bringing us together, KDU IRC -2018 allows to seek out and forge new partnerships, and to engage relevant sectors in advancing the social and economic well-being of mankind.

KDU is gratified to have a line-up of highly renowned keynote and plenary speakers consisting

of experts who would shed light on research and issues. In addition, this is an opportunity for undergraduates, researchers and practitioners to share their research and contribution towards the success of the respective professions, through oral and poster presentations.

The successful organization of KDU IRC -2018 required the talents, dedication and invaluable time of many academic and administrative staff of KDU, volunteers and strong support from our sponsors; the Ministry of Science, Technology and Research, and the Ministry of Telecommunication, Digital Infrastructure & Foreign Employment. Special gratitude and appreciation goes to the Presidents, Coordinators and the members of the numerous committees of the faculties. Without their wise advice and suggestions; outstanding organization, planning and performance, we would not have had such an excellent conference.

I hope KDU IRC-2018 would offer the participants a platform to exchange ideas, discover novel opportunities, reacquaint with colleagues, meet new friends and broaden their knowledge.

**Dr Upali Rajapaksha**  
Conference Chair  
11<sup>th</sup> International Research Conference

## MESSAGE FROM THE PRESIDENT OF THE SESSION



As the Dean of the Faculty of Computing of General Sir John Kotelawala Defence University (KDU), I am pleased to convey this message on the occasion of the 11<sup>th</sup> International Research Conference (IRC -2018) hosted by the University on the theme “Securing Professional Excellence through Collaboration”.

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 its educational system. In this respect, KDU has clearly identified its role, and it is committed to the task of helping the nation to bridge the gap between the need and the availability of a professional workforce to support the country’s national development endeavour adequately.

It is imperative for responsible human beings to achieve professional excellence in whatever field they perform. Computing touches nearly every aspect of modern living, and it is an area that generates professional opportunities of high potential. It re-engineers the conventional thinking patterns to provide innovative digital solutions. In this backdrop, highly skilled professionals in the field of Computing are needed more than ever to take up the social responsibility of generating knowledge and solving diverse issues faced by the contemporary world through technology, innovation and collaboration.

Our thematic session, “Computing for Professional Excellence through Collaboration”, incorporates these thinking patterns, and will be an academic platform to discuss innovations and achievement of excellence through collaboration amongst all stakeholders in the field. What is particularly pertinent in this context is the fact that ours is the first ever Computing Faculty established in a Sri Lankan state university, which offers the broadest range of Computing Degree Programmes in the discipline of Computing, i.e. BSc (Hons) degrees in Computer Science, Computer Engineering, Software Engineering, Information Technology and Information Systems, and thus we provide an ideal environment for professional collaboration in the field of Computing.

As the Dean of the Faculty, I am happy to note that we strive to maintain internationally accepted standards in the development of our course curricula thus encouraging research and innovation. The KDU International Research Conference 2018 itself exemplifies our commitment to the enhancing of professionalism through collaboration.

Finally, let me congratulate all contributors and express my sincere wishes for a highly successful conference, a forum for knowledge sharing and collaboration among undergraduate and postgraduate students, faculty, academics and industry practitioners of all disciplines.

**CAPT JU GUNASEELA USP, psc**  
 BSc. (Electrical and Electronic Engineering),  
 MEeg (Electronics and Telecommunication  
 Engineering), CEng.MIET, CEng.MIESL, MCSSL  
 President Computing

Plenary  
Session



## ROLE OF DATA SCIENCE IN DIGITAL TRANSFORMATION OF PUBLIC SECTOR

Terrence Perera

Assistant Dean – Academic Resources,  
Sheffield Hallam University, United Kingdom

As digital technologies are rapidly becoming an integral part of our daily lives, every industry is racing to embrace digital transformation as a vehicle to deliver better products and services to their consumers. Public sector organisations are no exception; it is universally accepted that only digital transformation could radically enhance services to public and lower overall operating costs. Within the context of digital transformation, data sciences play a key role by enabling organisations to understand their customers better and provide unmatched customer experience. For example, companies like Amazon, Disney and Uber rely heavily on data analytics to continually improve

and innovate their services. This presentation aims to emphasise the role of data sciences in digital transformation projects. Following a brief introduction to key technologies, a wide range of case studies are presented to highlight the use of data science technologies in digital transformation projects. The presentation will also discuss challenges and opportunities of digital transformation projects in the public sector.

**Keywords:** data science, digital technologies, industry

## INTRODUCING STEM EDUCATION IN STATE SCHOOLS ACROSS SRI LANKA

Ashu Marasinghe

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This report presents a proposal for the implementation of STEM (Science, Technology, Engineering and Mathematics) - education across state schools in Sri Lanka. The project partnered with SCCIP Japan Company Limited (SCCIP) and Kaatsu International University(KIU) – STEM Center will manifest the importance of a curriculum based on Robotics Education for students from grade one to grade ten in state schools in order to create a school culture where the significance of STEM education is highly recognized and valued. The project aims to consolidate the skills of students such as critical thinking, application of information gained through experience and reasoning and integration various education disciplines to solve authentic problems thereby, fostering innovation and entrepreneurial spirit among the young workforce of the country. This project will motivate for a strong robotics curriculum in order to encourage STEM education among school students. Robotics education is of a substantial platform to influence students as this will utilize student imagination for the process of designing, building and testing solutions for real-world problems. The novel curriculum will fulfill the needs of economic, scientific and technological developments in

the contemporary world of the fourth Industrial Revolution. This will strongly focus on student preparing to enter the job market with the necessary skills set which is an inadequate factor in the current education curricula.

The initial pilot project will commence with the launch of the robotics-based curriculum (developed by SCCIP) to a selected group of state schools across Sri Lanka. The schools include Royal College, Ananda College, Vishaka Vidyalaya, Sangamitha Balika Vidyalaya, Hemali Balika Vidyalaya and Darussalam Maha Vidyalaya. SCCIP intends to provide a STEM Robotics Curriculum for each grade, a STEM Robotics trained teacher and required STEM Robotics Kits and Software. This pilot project would encourage students to participate in Robotics competitions actively, conduct student-teacher exchange programs, summer camps & tours, etc. that will show cast Japanese advanced Technology and to develop the knowledge, skills & habits of mind associated with STEM disciplines by adopting an interdisciplinary & applied approach.

**Keywords:** School education, Encourage Students, Robotics Curriculum

## ENGINEERING HIGH PERFORMING SYSTEMS

Malith Jayasinghe

Director of Platform Architecture, WSO2

The performance of a system is often characterized by its throughput (ability to perform defined sets of tasks within a given period of time), response time (latency) and scalability. Performance is one of the main differentiators that determines the competitiveness of a product in the market. There has been a growing interest in developing high performing systems, particularly in the recent

past. Building such high performing systems is a challenging task due to numerous reasons such as its complexity and subjectivity. This paper discusses the core principles and guidelines for developing these high performing systems.

**Keywords:** performance, principles, complexity

## ARTIFICIAL INTELLIGENCE FOR NATIONAL DEVELOPMENT: ADDRESSING REAL WORLD PROBLEMS

HL Premarathne

Former Senior Lecturer, University of Colombo School of Computing Sri Lanka

Artificial Intelligence (AI) is a branch of computer science dealing with the simulation of intelligent behavior in computers. Nearly 75 years of active research on AI, the achievements include the favourable results in several areas such as robotics, code writing, agent technology, ubiquitous computing, IoT etc. However, differences between humans and machines such as emotions, understanding and consciousness require drastic improvements. In addition to

commercially motivated products with a flavor of AI, many issues related to the grass root level of a society, especially in the developing world need to be resolved. Close collaborative work among the researchers and the industry will be more productive towards national development.

**Keywords:** Artificial Intelligence (AI), collaborative research

Technical  
Sessions



## RICE YIELD ESTIMATION USING FREE SATELLITE AND FIELD DATA

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An effective pre-harvest rice yield estimation method is truly significant for the assessment of seasonal rice production in terms of strategic planning purposes. In Sri Lanka, a conventional method named crop-cut survey is used to estimate seasonal rice production, yet it fails to forecast rice yield before the harvest as it is conducted during the harvest. Therefore, this study is focused on identifying cultivated paddy lands and forecasting rice yield using free satellite data. Landsat 8 OLI/TIRS images (30m spatial resolution) from Earth explorer and 8-day composite images (250m spatial resolution) from Moderate Resolution Imaging Spectro-radiometer (MODIS) sensor on board NASA EOS Terra/Aqua satellite were used from 2014 to 2017. Paddy cultivated lands were identified by land cover classification by using field training samples and Landsat 8 OLI/TIRS data. In addition, the temporal change of Normalized Differenced Vegetation Index (NDVI) for paddy and forest was also analyzed to validate the classification. The observed minimum accuracy of the land cover classification

out of the tested four (4) seasons was 99.4%, and the minimum kappa coefficient was 0.9916. The correlation coefficient between reference net harvested paddy area and paddy cultivated area identified by Landsat 8 is 0.93. Linear and exponential yield forecasting models proposed by Sirisena, et al. (2014) for Kurunagala district were validated and tested based on NDVI and EVI2 vegetation indices obtained through MODIS (MOD09Q1v006) surface reflectance image of Polonnaruwa District. The comparison of the estimated yield with national statistical records, both NDVI and EVI2 based models, provide more reliable estimations about 80 days after the transplanting of each season, but, EVI2 based model (derived at 80 days) gives more reliable estimations than NDVI based model with 86.37% of average accuracy. Therefore, seasonal rice yield can be successfully forecasted one month prior to the harvest time using EVI2 based model in the Polonnaruwa district.

**Keywords:** EVI2, Landsat 8 OLI/TIRS, MODIS, NDVI, Rice yield

## SOFTWARE FOR COMPLEX PROCESS AUTOMATION AND STAKEHOLDER RELATIONSHIP: STATE-OF-THE-ART IN HYDROGIS TOOL FOR URBAN FLOOD MANAGEMENT

RMM Pradeep<sup>1</sup> and NTS Wijesekera <sup>2</sup>

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To make sustainable decisions in policy making/ public decision making, the assisting software should provide sustainable options. This is very important in urban flood management, due to the involvement of number of stakeholder groups. In order to develop such software, a software development effort needs to realise the basic requirements of sustainable decision making, which need more research. The present work attempts to study the available researches for sustainable decision making process in urban flood management and analyse according to the

software development profession. The present work utilises a HydroGIS tool development effort, which was developed for urban flood management, to review the literature findings. The study found the importance of understanding the complex-process integration with recipient stakeholders for the development of a sustainable decision making software.

**Keywords:** Sustainable software, Recipient Stakeholders, HydroGIS tool, Urban Flood Management

## NEW CUSTOMERS CHURN PREDICTION MODEL FOR MOBILE TELECOMMUNICATION INDUSTRY

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The present Sri Lankan telecommunication industry remains extremely dynamic by constantly changing the landscape of new services, technologies, and carriers. Thus customers have more choices. So, predicting customer churn is one of the most challenging targets in the telecommunication industry today. The major aim of the study is to develop a novel customer churn prediction model for Sri Lankan Telecommunication Company by considering some soft factors for early identification of customers who leave the service provider. Three machine learning algorithms namely Logistic Regression, Naive Bayes and Decision Tree are used in this study. In fact, twenty attributes are mainly carried out to train these three algorithms. Furthermore, the Back Propagation Neural Network (BPNN) was trained to predict customer

churn. In Artificial Neural Network (ANN) training; result of Logistic Regression, Naive Bayes and Decision Tree and eight attributes that mostly affecting the final result are used as inputs. The performances of the models are evaluated by using the confusion matrix using three different data samples. Final ANN model gives 96.7% accuracy in the testing process. Also it gives a high accuracy when comparing with the other data mining algorithms. Existing customer churn prediction models are designed using single algorithm. But the experimental results in this study show multiple algorithms for churn prediction that give higher performance than a single algorithm.

**Keywords:** machine learning, neural network

## IMPACT OF BIG DATA AND POLITICAL MICROTARGETING ON DONALD TRUMP'S 2016 PRESIDENTIAL CAMPAIGN

Narishia Singh<sup>1</sup> and Anuradha Wijegunawardhana<sup>2</sup>

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On January 20th, 2017, Donald Trump was inaugurated as the 45th President of the United States. His opponent, Hillary Clinton, was a seasoned politician who was favored to win the election. However, Trump produced one of the biggest political upsets in modern day history. This explanatory case study aimed to explain one of the reasons that Trump won by looking at the role that technology played during the 2016 presidential election. Specifically, this study examined how big data was leveraged to influence voter behavior during the campaign. Data drawn

from articles, interviews, and videos published during the campaign were collected and analyzed thematically. Results identified three main themes that were particularly salient: mobilization of voter databases, data-driven microtargeting, and Facebook influence. This study highlights the potential benefits of targeting voters using big data analytics as well as the potential risks related to issues of privacy.

**Keywords:** Big Data, political micro-targeting, psychographics, election campaigns

## PREDICTING THE RISK OF BEING A DIABETIC PATIENT USING STATISTICAL ANALYSIS AND DATA MINING

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There is a vast and enormous amount of data available in hospitals and medical related institutions. But, the amount of knowledge obtained from such data is very little. Applying IT knowledge for healthcare is an emerging field of huge importance for providing prognosis as well as a deeper understanding of medical data. Diabetics is actually a disease which is affecting many people today Early prediction of diabetes is an extremely challenging task because of the complicated interrelationship between various factors. This research tried to diagnose diabetes which based on 12 risk factors using data from 200 people and applied data mining and statistical

techniques to predict the risk of being a diabetic patient. Statistical model has been created using Minitab with the application of the binary logistic regression model. The created model provided the way of predicting the possibility of having diabetics for any person and identified the most suitable risk factors which are most relevant to the disease prediction. Through this identified risk factors, we clustered the data using k-means. An empirical study has proved the effectiveness of our proposed approach.

**Keywords:** Binary logistic regression, Data mining, K-means clustering

## PARALLEL QUEUE OPTIMIZATION THROUGH COMPUTER AIDED SIMULATION AND QUEUEING THEORY: A CASE STUDY ON MATTA CANTEEN OF SABARAGAMUWA UNIVERSITY OF SRI LANKA

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A greater awareness and higher use of simulation technology caused many recent advances in the industry. ARENATM is a commonly used and convenient modeling and animating tool in the industry. It is grounded on object-oriented programming concepts and hierarchical modeling. Queuing is an obvious problem of the domestic canteens lacking the business philosophy of customer-centric in a market economy. When the simulation is over, we can find the model results and investigate the performance measures of our interest. As a case study, we selected the Matta Canteen of the Sabaragamuwa University of Sri Lanka. We simulated their process from 11.30 am to 1.30 pm. We applied the M/M/c queuing

model for 2, 3, and 4 servers. The current system of 2 serving points has a 52.6 second waiting time in the queue, 3 serving points have 3.1 seconds and 4 serving points has 0.6 seconds. The average of customers waiting in the queue for the 2 serving point model is around 10 customers, but for the 3 serving point model, it reduced to 1 customer. According to our model, our recommendation is the 3 parallel servers to the current system. Our recommendation is further proved as the optimal model of the system using ARENATM and the queuing theory.

**Keywords:** Queue, Queueing Theory, Simulation, Food Serving, ARENATM

## ARTIFICIAL NEURAL NETWORK BASED NEW CLASSIFICATION METHODOLOGY FOR IDENTIFYING KIDNEY DISEASE RISK LEVELS

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The healthcare sector has vast amount of medical data which are still not properly analysed; especially, discovering useful information to predict future patterns is very limited. By using data mining techniques, the current study introduced a novel classification methodology and successfully applied it in Sri Lankan domain for Chronic Kidney Disease (CKD) classifications. The current study is carried under the two phases. In the first phase, Artificial Neural Network (ANN) method namely multilayer feed-forward

neural network was used to detect whether a person has a risk of having a kidney disease or not and their risk level. In the second phase, a novel forecasting methodology is proposed using multiple algorithms, which is a combination of Random Forest algorithm and an ANN hybrid methodology to detect whether a patient has fallen into a CKD or not.

**Keywords:** Artificial Neural Networks, Data Mining, Random Forest

## A MACHINE LEARNING BASED SOLUTION FOR FINDING PERFECT MARITAL PARTNER

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Marriage is a socially or ceremonially perceived joining between mates that sets up rights and commitments between those life partners. Finding a good marriage partner is one of the main reasons for the delay in marriage. Therefore, there is a need for a solution that can get user details and expected partner preferences and suggest proper matches based on their preferences. The objective of this paper is to discuss the necessity of the proposed model for Sri Lankans. The proposed solution will maintain user details and get user's preferences for their matrimonial partner. Based on the preferences, appropriate matches will be

displayed to the user using a clustering algorithm along with the matching percentages. Horoscope of the user will be generated based on the planet details of the user. Furthermore, previous birth connection and 'dosha' identification will also be done. The proposed solution will also enable of sending messages to the matches and get email notifications about those matches. The final aim of this solution is to ease the matchmaking business by providing proper matches.

**Keywords:** Matrimonial Partner, Horoscope, Clustering, Matches

# CLOUD BASED POWER CONSUMPTION ESTIMATION FOR ELECTRIC VEHICLES

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Inaccurate range estimation is a major problem which comes with Electric Vehicles. Because of this many people face issues when planning long trips and short trips with limited battery capacity. To overcome this issue, it is necessary to have a better power consumption prediction algorithm which uses vehicle data and other dynamic environmental conditions. This paper is based

on cloud based power consumption estimation system which uses linear regression in machine learning to obtain a better estimation based on above mentioned areas.

**Keywords:** Electric Vehicle, Range, Power Consumption, Estimation

## WATER INTAKE RECOGNITION SYSTEM BASED ON PRESSURE SENSORS AND BLUETOOTH TECHNOLOGY

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Dehydration is a very common problem especially among the elderly people and patients, and monitoring daily fluid intake of a person is vital to avoid dehydration and many other diseases. When we talk about the importance of water, it is an essential element of life. Automating the fluid intake monitoring can help to avoid the risk of losing the recommended daily fluid intake. An automated system can monitor and keep tracking the daily fluid intake and send reminders to the users and guide them towards wellbeing. In this

research, a system is developed to help elderly people as well as patients to monitor their fluid intake. The system is developed with a special stand using pressure sensor and Bluetooth and an android application which provides records and reminders. It was observed that the system provides accurate results and it is a low cost solution.

**Keywords:** Fluid intake monitoring, Pressure sensor, Bluetooth

## METHOD TO ENHANCE FEATURES OF BIOMETRICS SECURITY MANAGEMENT AND FINGERPRINT IDENTIFICATION USING LOW-QUALITY IMAGES

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Fingerprint identification becomes the most well-known biometric system in nowadays. The system uses special fingerprint points called miniature which is unique for every person. Many systems have been used for various algorithms to do their identification process. Low-quality fingerprints are an unavoidable problem which occurs due to various reasons such as deformations of the skin and dryness. This research proposes a set of algorithms and provides a suitable solution for problems occurred by low-quality fingerprint

images. Miniature marking use triplets, segmentation using morphological operations were used as the novel changes in this system. The novel triplet miniature method solved the alignment problem, which is a significant factor in extracting miniatures. The standard methods of Gabor filter was used for the image filtering. The proposed system, coded using MATLAB was successfully implemented and working same as other recognition systems.

**Keywords:** Fingerprint identification, Low-quality fingerprints, Miniature, Alignment, Gabor filter

## KNOWLEDGE SHARING SYSTEM FOR DENTAL EXTRACTION IN ORDER TO ASSIST DENTAL DOCTORS AND ASSISTANTS

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Even though tooth extraction is one of the common surgical procedures in the dental field, it needs an extensive knowledge and practical experiences when handling the dental extraction equipment such as dental extraction forceps. Otherwise, it will be more complex or even in a worse case as it may cause damages to patients' mouth area. Hence, it is very important to have a sound knowledge of the instruments to be used, especially on extraction forceps. So, the knowledge of extraction forceps should be disseminated properly. After identifying this need, as a first stage, we gathered the information regarding the dental extraction forceps from the experts in the field. Then we started developing ontology as a second stage. Protégé OWL Ontology Editor 5.1

was used for this purpose. Finally, the developed ontology was evaluated in two folds; by using inbuilt tools and by ontology experts as an iterative approach. We strongly believe that our novel approach on dental extraction forceps ontology can support the dental students, dentists as well as their assistants to improve the knowledge and helpful in learning practices. Our next step is to model the ontology for whole extraction process and to develop a knowledge management system portal on dental extraction forceps.

**Keywords:** dental forceps, ontology, knowledge sharing

## AUTOMATED PREDICTION OF CUSTOMER HOTSPOTS TO TAXI DRIVERS USING CLUSTERING TECHNIQUES AND WEB SCRAPING

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Taxi service is one of the most important service in our society. There are many mobile application to customer to book a taxi. But the problem is that applications are not utilized properly to find taxis to customers in a city area or a busy environment because the demand for taxi exceeds the supply. Purpose of this research is to predict the taxi travel demand in a city area. So that mobile applications can utilize properly to guide taxi drivers to give a proper service to customers. The prediction is done clustering the historical data such as time, weather, location using clustering techniques like k-means and DBScan we can cluster the data and cluster hotspots of customers can be found.

There are websites that shows details about the upcoming events. In that websites we can find event location, time and other details about the event. So using web scraping techniques we can scrape those data to get that event data. Using those data we can notify the taxi drivers about the nearby events. So they can easily find more customers who are attending to those events quickly. By this method the time and money of both taxi drivers can be saved. So the profit of taxi drivers will be increased.

**Keywords:** clustering, web scraping, taxi

## IMAGE PROCESSING BASED AUTOMATIC PELICON CROSSING SYSTEM

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Traffic congestion and pedestrian accidents are two major issues that the Sri Lankan society face today. Many social, economic and environmental problems increase due to the two issues. Lack of effective Pedestrian Light Controlled (PELICON) crossing system in Sri Lanka is one of the reasons for road traffic congestion problems. Thus in this paper, we propose Image Processing Based Automatic PELICON System. The proposed system first takes an image input to the system using CCTV camera. Then, it identifies the particular color ranges using color detection algorithms. Next, noises are removed using filters. Finally, the system uses background subtraction and contour analysis algorithms to identify pedestrian object contours. The system then calculates the number of pedestrians. If the

pedestrian object count is greater than a given threshold value or if the pedestrian waiting time is exceeded, then the system shows green signal to pedestrians and red signal to vehicles. Empirical study of our prototyping system has proved the effectiveness of our pedestrian detection approach. Further, we conducted a questionnaire survey to check the suitability of this system to the Sri Lankan society. Randomly selected people were taken to this study as the sample population. According to the study results, the system will minimize road traffic congestion and other negative impacts of the traffic congestion.

**Keywords:** Color detection, Background Subtraction, Contour analysis

## A NOVEL ELLIPTIC CURVE BASED MULTI-KEY ENCRYPTION METHOD FOR MULTICASTING SINGLE CONTENT WITH ACCESS CONTROL

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The most remarkable invention in the history of cryptography is the invention of public key encryption in the 1970s. It enables users to have a single encryption on a pair of two unique keys. As a result, the way of delivering many security services has changed drastically. Moreover, it introduced new features such as non-repudiation to the cryptographic world. However, in this paper, we present a novel elliptic curve based multi key encryption method to facilitate a single encryption for multiple users where the resulting encrypted content can be multicast to them with access control. Initially, we establish an elliptic curve based public key infrastructure to cover the whole user space. Then the sender can select multiple recipients using their public keys with the desired access levels and generate a unique polynomial for that using the Lagrange polynomial interpolation. Next, the content

is encrypted using the generated polynomial and multicast it to the recipients. Finally, the recipient can use their private key together with the polynomial to decrypt the received content. Encryption is robust because the elliptic curve cryptography is stronger than the present RSA encryption. Moreover, it is more suitable for mobile devices due to small key sizes. However, the cryptographic libraries have to be improved and optimized in order to make it practical. Further, the applications like email clients, media players, document viewers have to be enhanced to integrate this cryptographic mechanism as an add-on.

**Keywords:** Elliptic Curve, Multi-key Encryption, Access Control

## ARTIFICIAL INTELLIGENCE APPROACHES FOR IMPROVED ADAPTABILITY IN AN ADAPTIVE E-LEARNING ENVIRONMENT: A REVIEW

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The concept of e-Learning, which has emerged with the rapid advancement in technology, is a crucial aspect in the field of education. The major issue with the traditional concept of e-learning is that it delivers information to all students in the same manner, irrespective of their individual learning requirements. Adaptive e-Learning Systems, which emphasise the significance of the differences in individual learning styles in modelling the ideal learning environment, attempts to bridge the gap between the student and the instructor that can be observed in a traditional e-learning environment by identifying and catering to individual learner requirements and capabilities. Artificial Intelligence techniques which have the ability to replicate the decision-making process of humans, are significant in the domain of adaptive e-Learning as they can be used to improve the adaptivity of the system. This paper assesses the Artificial techniques; Fuzzy Logic, Neural Networks, Bayesian Networks and Genetic Algorithms, emphasising their

contribution towards the concept of adaptivity in the context of Adaptive e-learning. The study indicated an increase in the adaptation of Fuzzy Logic techniques, specifically Type 2 Fuzzy Logic Systems, and Bayesian Networks in the development of the Student Model in order to deal with the uncertainty of learning and student diagnosing processes. The application of Artificial Neural Networks to overcome issues in the existing Adaptive E-learning Systems, has also been identified through this review where the application of feature extraction via the Neural Network approach is an effective methodology to be used in the development of the Adaptation Model of an Adaptive E-Learning System to extract the most appropriate characteristics that can be used to identify learning styles of learners.

**Keywords:** Adaptive e-Learning, Artificial Intelligence techniques, Fuzzy logic, Bayesian networks, Neural Networks, Genetic Algorithms

## FOSTERING SOCIAL ENGINEERING AWARENESS: PROACTIVE MODEL

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Social Engineering aims to trick users into revealing sensitive information by making use of their lack of literacy in Social engineering tricks and the limited or no technical mechanisms on their systems to protect against such attacks. The motive of this research is to check the awareness and perceptions on social media of employees from the Information technology sector as well as the other sectors in an equal proportion. This paper shows a series of results which shows the weak points of defending against Social engineering attacks as an individual and in an organizational point of view. The methodology used to conduct this research was an online survey which was sent through email and social media and was

successfully completed by 118 people and rejected by approximately 50 people. The awareness or the need of training to identify Social engineering tricks can be clearly seen by the analysed results. As a solution to this escalating issue, this paper suggests a model which is named as 'Proactive model A' that can be used by individuals as well as organizations to mitigate the risks of Social Engineering attacks by implementing the model in their policies and training programs so that it can help in minimizing the damage to critical assets of the organizations

**Keywords:** Social Engineering, Proactive defence, Cybersecurity

## PERSONALIZED TRAVEL SPOT RECOMMENDATION AND GUIDANCE SYSTEM FOR SRI LANKAN TOURISTS

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Tourism in Sri Lanka is an evolving field which is significantly influencing the development of the country. With the rapid advancement of Affective computing and its' diverse paths where applications are being implemented by facilitating user needs and emotions, tourism has become one of the prominent fields to provide a comprehensive analysis of useful inclination in specific travel spots based on the user interests and emotions. Traditional tourism methodologies where a travel guide guides on a tourists' journey has nowadays become an old fashion where the tourist himself has innovative applications which provide a guide in almost all the areas in his journey beginning to end. This study proposes a solution where tourist gets a personalized recommendation on travel spots to visit, a summary of the recommended travel

spots with a native language translation facility and a translating system to translate landmarks displayed on travel spots such as notice boards and signboards into their native language. Our system divided into four components focusing on (a) profiling users, (b) identifying user locations and travel spots, (c) extracting user reviews about travel spots, summarize and analyse sentiments levels and (d) identifying landmarks displayed in travel spots and translate them into traveller's native language. This approach makes ease traveller's life providing personalized recommendations based on collaborative and content filtering approaches.

**Keywords:** Personalized recommendations, Travel spot, Sentiment analysis

## WEB, MOBILE AND COMPUTER ACCESSIBILITY: ISSUES FACED BY THE SRI LANKAN VISUALLY IMPAIRED COMMUNITY

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Though Information Technology and Internet provide benefits to their customers, there is still a gap existing between none-differently abled and differently abled users. This gap is known as Disability Digital Divide. When compared to none-differently abled, differently abled users face a disadvantage when accessing these technologies. In Sri Lankan context, there is no proper planning or guidelines to overcome these issues specifically faced by the visually impaired community. Therefore, this research focuses on addressing those issues and finding constructive solutions. The study focuses on three main research questions. Firstly, it identifies the problems and issues faced by visually impaired people when accessing personal computers, mobiles, Internet and web related technologies. Secondly it concentrates on technological accessibility related issues in relation to these technologies and finally, how the above problems and issues can be rectified. This study was conducted by engaging in in-depth interviews with visually impaired individuals and observing Computer, Web and mobile accessibility issues.

Snowball sampling was used and this research directly benefits visually impaired community allowing them to overcome the obstacles, problems and issues they are facing in their day to day life in the context of Information accessibility. Findings indicated that, current websites failing to adhere to Web Accessibility guidelines, difficulties in software accessibility, human perception on technology, financial difficulties to purchase and use of equipment are the major issues. Solutions recommended to overcome such issues and improve the accessibility among the Sri Lankan community include standardization of web and internet facilities, concentration on user friendliness in software development processes, infrastructure development, and financial support for visually impaired people and special training and education on technology with proper guidance.

**Keywords:** Web Accessibility, Mobile Accessibility, Computer Accessibility, Information Accessibility, Visual Impairment

## GPS BASED SAFE LOCATION GUIDING ANDROID SYSTEMS IN CASE OF TSUNAMI

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Tsunami can be defined as giant waves caused by earthquakes or volcanic eruptions under the sea. Out in the depths of the ocean, tsunami waves do not dramatically increase in height. But as the waves travel inland, waves build up to higher and higher heights as the depth of the ocean decreases. It has been scientifically proved that the speed of tsunami waves depends on ocean depth rather than the distance from the gravity of the wave. This research is to establish a tsunami guidance system and to make the general public aware about such a disaster and to guide them to the nearest security sites. The major problem that has been identified in this research is the impossibility of arriving in a safe place and the lack

of knowledge in case of tsunami. The probability of predicting a disaster is very unlikely, thus the resulting damage is immense. Once this scenario is taken in to consideration, this research has identified some problems. Among them, the lack of preparedness for potential tsunamis, the lack of resources and the exotic staff have no idea of reacting and getting warning signals. But one of the major issues of this research is the inability to track Tsunami alerts and arrive at a safe place in the easiest way.

**Keywords:** Tsunami, easiest way, distance, warning signals

## IMPACT OF ADOPTION OF HOMOMORPHIC ENCRYPTION: SECURITY ENHANCE GUIDELINE FOR SRI LANKAN MILITARY SYSTEM

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At present, Information security increases the conversation with the occurrences of many data vulnerabilities in current systems. It is now mandatory for all system domains to consider and implement Information security plans. One current procedure which follows for securing information is Data Encryption, especially during end-to-end transmission across computer networks. Encryption is a method by which plaintext or any other type of data is converted from a readable form to an encoded version that can only be decoded by another entity if they have access to a decryption key. Data Encryption has been and still is an area that is continuously being developed. As of today, the latest technology in this area is Homomorphic Encryption - conversion of data into ciphertext that can be analysed and worked with as if it were still in its original form. Ciphertext is plain text exposed to "Cipher" algorithm which is applied

to plain text to get ciphertext. The authors present here the applicability of this technology on Sri Lankan Military Domain. The methodology used to conduct this research is a qualitative and quantitative based survey. The online survey was circulated through e-mail and the survey was successfully completed. According to the survey it could be analysed that the security when transferring data/information in this domain is very low-grade, which in contrast, must be very high due to the presence of sensitive data related to national security of the country. The authors have designed in detail on a set of recommended guidelines for secure transmission of military data using this technology.

**Keywords:** Information Security, Homomorphic encryption, Encryption Technology, Adoption of encryption.

## AN EFFICIENT WEB ENABLED AUTOMATIC EMERGENCY MEDICAL ASSISTANCE SYSTEM USING ANDROID

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This paper introduces a system to manage medical assisted emergencies in certain areas. At present, Sri Lanka and many other countries in the world face many difficulties in managing emergency medical situations even though telecommunication has been developed and it provides the technology needed for this kind of healthcare systems. Scarcity of Infrastructure and resources needed for such situations is a major problem in many areas of the country and in the world. The probable cause for this is that the relevant authorities do not pay much attention to this problem. As these situations occur abruptly without any warning, the implementation should be mobile. Thus, the mobile part has

been developed on android platform. It will automatically send the location to the guardian and the same app will collect the information and the, location of the patient, and it will inform about the problem to the health care centers or the emergency services in the relevant areas. Through this system, public can directly connect to them, and they can get a fast and efficient response from the emergency medical assistance team who will receive patient's information from the web-application.

**Keywords:** Location, GPS, Android, Emergency Medical Assistance, Web-based patient information

Poster  
Sessions



## ADAPTIVE SOLUTION FOR KEY CHALLENGES IN INTERNET OF MEDICAL THINGS

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Internet of medical things refers to the worldwide network of interconnected medical devices based on a standard communication protocol. Moreover, it is about interconnected medical devices via the internet at any time, with anyone, at any place, to any service, from any network. With the rapid advancements of technology connected through the internet, the healthcare field is also affected immensely. This study is an attempt to investigate the most useful technologies and key challenges regarding the Internet of Medical Things nowadays. In addition, an adaptive solution to address the identified challenges is proposed. The main method of this research was the work of gathering information carried out as a literature study and comparing different systems and architectures which are being used in different technologies. There are many standard methods to ensure the security, privacy and the data integrity of the sensor data. In this study,

three methods: Advanced Data Encryption, Attribute-Based Encryption and Proven Data Possession are selected for proposing the solution. The proposed model shows how these 3 methods along with cloud technology address the identified challenges: Security, Privacy, Data Integrity, Processing Power and Storage Issues in medical applications. Local databases are the most common use of the data storage. This model is giving a cloud-based solution along with the algorithm which helps to increase the security level of the sensor data. The used encryption and data provable methods are most recognized and strong algorithms in today's world.

**Keywords:** Internet of Medical Things, Advanced Data Encryption, Attribute-Based Encryption, Proven Data Possession, cloud technology

## ANALYSIS AND DEVELOPMENT OF MESS MANAGEMENT SYSTEM FOR THE KDU CADET MESS

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Sri Lankan Military Mess Management and cost calculations are done manually and there is no proper system for electronic payment handling. Hence all the difficulties in manual system such as time consumption and human errors are inheriting to mess systems. Due to these problems, a requirement arises to create a system that will make the entire Mess Management an automated system. The present work automated the mess system which allow manipulate all the details about the payments and military personal and easy generation of reports using C# and SQL

server. Further system also provides data on bar sales to be analysed with use of dashboards. Finally the present work allows mess management staff to engage in their work with maximum security and risk free from errors or loss of data. This new automated system will be interconnected with all end-users of the mess and all duties will be able to be proceeded easily with this Mess Management System.

**Keywords:** Stock, backup, restore, add, delete, Payments, Reports

## EMERGENCY ALERT SYSTEM FOR REPORTING CRIME ISSUES TO NEAREST POLICE STATION

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In the recent past there had been a tendency of crime rates to increase and the main reason for this is the lack of possible means to keep the Police informed immediately. Thus there is a possibility of the criminal escaping the crime scene when the Police arrives. A mobile application with an Emergency Alert System to report crimes to the nearest Police Station has been proposed to overcome this issue. There are different types of Crime Alert Systems used all around the world. However in Sri Lanka there is no properly developed computer-based Emergency Alert System to report crimes to Police. The utilization

of the introduced application will allow the witness or the victim to inform the nearest Police Station and Mobile Police. The application allows the user to mention the location and share the type or nature of the crime which will allow the Police Officer to be aware of the nature of the crime before he/she arrives at the place of crime. Using the tracking facility available in the application the Police Officer will also be able to identify the exact location of crime. Therefore, this application will assist in the process of decreasing crimes.

**Keywords:** GIS, Location Tacking, Policy, Crime

## AN E-COMMERCE WEB APPLICATION FOR AGRICULTURAL DEVELOPMENT IN SRI LANKA

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This research has been conducted to develop an e-commerce web application based on agriculture, which is used by cultivators, and consumers across the nation. This application also includes the capability of adjusting and functioning on mobile phones. This e-commerce application acts as a mediating platform between the cultivators and the consumers making it possible for both parties to directly interact with each other without the aid of a third-party, who in Sri Lankan scenario gains the highest profit of getting the agricultural products from the cultivator to the consumer. Due to this web application, users will be aware of the agricultural products in other geographical locations.

This e-commerce website has a great possibility in increasing profit for the cultivators in rural areas and also the consumers of the agricultural products. This web application could also be predicted to drastically lower the consumer end-price of agricultural goods, which can encourage people to consume healthier food. On the other hand, this could be a great incentive (morally and financially) for the cultivators to cultivate and promote their geographical and agricultural products. Therefore, the country can develop more in the path of agriculture.

**Keywords:** e-commerce, web application, agriculture

## SAFE ACCIDENT ALERT SYSTEM FOR REPORTING ACCIDENTS TO NEAREST HOSPITAL AND POLICE STATION

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Road accidents are fast becoming one of the major causes of deaths in Sri Lanka. It is only in exceptionally remote areas, where there is not really any vehicular traffic on the streets, are they not a cause for concern. There are numerous factors involved in the cause of road traffic accidents including: drunken driving, lack of knowledge about road rules and regulations, high speed, use of mobile phones while driving etc. A mobile phone application for the Analysis of Traffic Problems and a Safe Accident Alert System has been proposed to help with this growing problem. There are different types of Accident Alert Systems all around the world but in Sri Lanka no proper computer-based Accident Alert System has been developed as yet. An effective Safe Accident Alert System as a mobile application tracks the location of an accident using GIS and SMS services. This application will then alert those nearest police stations and

hospitals who are able to react most quickly by analysing all the local traffic issues. The main objective of the system is to provide help quickly for the vehicle user by detecting when an accident has occurred and informs the respective authority through wireless technologies giving the location of the vehicle. Thus treatment for any casualties can be more speedily provided. Many lives could have been saved if medical attention was given as soon as possible after an accident. Mobile phones are used by most people for many tasks of daily activities nowadays. Road traffic accidents and minimising the severity of injuries and number of deaths caused by them is one important area where they can play an important role when used in conjunction with a properly developed SAAS application..

**Keywords:** GIS, Location tracking, Alert Message

## A SOFTWARE SOLUTION FOR IMAGE IDENTIFICATION AND ARTISTIC SKILLS FOR VISUALLY IMPAIRED PEOPLE USING BRAILLE

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At present, visually impaired individuals have no method to perform or engage much in art. They do not draw paintings because of the absence of the ability to draw a world unknown and unseen before. New immersing software are developed within the world and the success of it is enjoyed only by the visually impaired who can afford it. The conversion of an image to braille and getting a braille printout of the image is the main aim of the new software application. By studying previously developed systems, new features were identified. Reducing the complexity of the

software solution and providing the main output of a well converted image from the basic shape to complex image conversions will be made possible. With the results of the survey conducted for the research it emphasized the necessity of a software solution to give the opportunity to the visual impaired to engage in art using braille.

**Keywords:** Braille, Visually impaired, Art, Image Identification

## A REVIEW ON DATA MINING TECHNIQUES TO PREDICT THE STUDENT PERFORMANCE AND DECISION MAKING IN EDUCATIONAL INSTITUTIONS

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Education is significant as it represents the future of a nation. Most of the Sri Lankan educational institutions utilize manual, paper-based systems to manage information which are more time and money consuming. It also reduces the accuracy and work efficiency. Nowadays the commercial world is fast reacting to the growth and potential in data science and as a result, data mining is getting much attention from many researches at present, and data mining assists to discover patterns within enormous amounts of data, stored in databases and data warehouses. Therefore, adapting these techniques will help to find interesting patterns to predict the student performance and to find the grades of students based on their examination results. Through this review paper, an effort is

made to investigate a best data mining technique to quantify the student performance to provide benefits for academic staff, administration staff and students. The prediction on performance will provide more precise results and students may receive more accurate predictions which may help to make important decisions in their careers. Most importantly, this will reduce the workload of the administration and will surmount many challenges pertaining to the scholastic field providing a user-friendly environment.

**Keywords:** Data Mining, EDM, Classification

# DATA SECURITY SYSTEM FOR CHAT APPLICATIONS USING CRYPTOGRAPHY, STEGANOGRAPHY AND IMAGE PROCESSING

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The privacy plays a major role in one's personal life. Due to the vast development in communication technology, people have the privilege to perform various operations seamlessly in their day to day life. But at the same time, privacy of some of those things such as confidentiality of communication is lacked due to the actions of another party. A message sent by the sender(s) should only be revealed by the intended recipient(s). Due to privacy issues, from the past, people used various secret methods to preserve confidentiality of their information. Out of those, one of the developing science was steganography. Steganography is a method of encryption that hides data among the bits of a cover file, such as a graphic or an audio

file. To read an encrypted file, you must have access to a secret key or password that enables you to decrypt it. At present this is widely used in various areas to secure valuable information. But in most existing systems, their security has not been trusted. This research proposed a secure, flexible steganography mechanism to encrypt highly confidential messages that avoid them from being accessed by an unauthorized party.

**Keywords:** Data Security, Steganography, Encryption, Communication Technology, Confidentiality

## WORKERS' ALCOHOL DETECTION AND PREVENTION SYSTEM

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Factories are industries of vital importance, and they operate with two main resources, machinery and manpower. When dealing with Machines, workers should work carefully as an error could lead to injury or loss of life and trade. The biggest industrial machine which operates with high power are critical because a small mistake upon those may lead to huge losses. In this paper an automatic system to detect alcohol ingesting of factory labourers and the engine shut down with a warning scheme is described.

Though this is a common problem in many factory areas no one seems to focus on it in order

to prevent the problem that could occur when dealing with machines and lives right away. Humans are always doing silly things. But taking alcohol and doing some heavy stuff in their working areas could lead them to huge losses even more than people could ever imagine. So, in this research paper, how to take control of these things and to prevent workers from alcohol usage in their own working area has been summarized.

**Keywords:** Alcohol Detection and Prevention, Arduino, Software and hardware based solution

## FAST AND ACCURATE PALM-PRINT RECOGNITION SYSTEM FOR LOW-QUALITY PATTERNS

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Palm-print trait based biometric identification has emerged as a most powerful tool to recognize a person's identity. It is used in commercial and forensic applications. In common, it considers 400 dpi (Dots per Inch) or more as high resolution and 150 dpi or less as low resolution. Earlier research projects had been showed that high-resolution palm images are capable to extract ridges, singular points and minutia points as features. Low-resolution images have capability to extract principal lines, wrinkles, and texture. Therefore, researches which are based on palm prints primarily focus on high-resolution palm images. Therefore the main purpose of this research was to provide a Fast and Accuracy Palm-print Recognition method for low-quality images using image processing with feature extraction. In this research, the database which was used for this is mainly consisted with the palm images which were collected from students. In feature extraction process, low pass filter was used to remove the

noises of images. Elongated and tubular structures were enhanced in the noise removed images to highlight major lines by using Hessian-based multi-scale filtering. Segmentation process in the original image transforms the original image in to a binary image in which ridges area fully colored in one tone and the background in the opposite tone. Threshold binary image was applied to some morphological operations to extracting the better results. The palm-print matching process which is also called as the template matching was mainly based on the normalized cross correlation in Fourier domain (phase correlation). This process was done by pixel-by-pixel basis. Results of this process have shown a higher Genuine Acceptance Rate for lower False Acceptance Rate and False Reject Rate.

**Keywords:** Low Resolution, Principle Lines, Feature Extraction, Template Matching

## SMART TEA LEAVES DISEASE ANALYSER: MOBILE BASED DISEASE DETECTING AND SOLUTION PROVIDING SYSTEM

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Sri Lanka is well-known for its excellent TEA and as the 3rd largest tea manufacturing nation internationally. Sri Lanka is one of the main world's top TEA exporters with a high global demand attracting millions of foreign exchange, which strengthens the backbone of the economy of the country. Tea is grown in the whole country including central highlands and southern inland areas, resulting in a lot of diversity in the taste of Sri Lankan tea. Although TEA is an important agricultural field, the lack of attention, lack of resources, high cost of production have reduced its productivity and quality. One of the main reasons for this low productivity can be identified as tea leaf diseases due to changes in weather, infertile soil, pests, etc. This research paper suggests an automated and economical methodology to draw-up the current inefficient

manual process of disease detection of tea leaves in tea cultivation by new trends of computing field such as image processing and machine learning techniques. The steps such as Image Acquisition, Image Segmentation, Image Pre-processing, Feature Exaction and Classification and Detection of tea leaf diseases are developed into an android application to provide effective, efficient, cost-effective and highly accurate system which will establish safer growing conditions. Also, the suggested solution will reduce the environmental and ecological impact due to usage of chemicals only in necessity to approved amounts to recommendations of the mobile application.

**Keywords:** image processing, Leaf disease detection, mobile technology, Smart agriculture

## HAIRSTYLE RECOMMENDATION BASED ON FACE SHAPE USING IMAGE PROCESSING

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Hair styling is an art of fashion transformed since ancient era, with the influences from diverse factors. It has been a primary aspect of human lifestyle and society in various different ways with the growth of research fields like modelling human, visual searching, visual matching, facial verification for security measures etc. Perfect hairstyle improves specially a woman's self-confidence. This paper presents a hairstyle recommendation system based on face shapes and suitable hairstyle with expert's knowledge for the face shape derived from face shape classification algorithm. Recommendation algorithm has developed based on the learning relationship between facial shapes and suitable hairstyles. This research has classified face shapes into 5 different shapes: round, oval, oblong, square, and heart. Here, machine learning libraries were used

to detect the landmarks of a face image in the face shape identification process. The accuracy of our face shape identification algorithm is 85% out of 100 images. After identifying the shape of the face, recommendation system proposes suitable hairstyles for the face image. Here, the python programming language and image processing techniques have been used to develop the algorithm. The system will allow users to upload a preferred face image, process it and will automatically select the matching hair styles category for the given image. Empirical study of our prototyping system has proved the effectiveness of our recommendation algorithm.

**Keywords:** Face Shape, Facial Feature, Hair Styling, Image Processing, Landmark Detection

## CONSISTENCY IN MULTIPLAYER ONLINE GAME IN CONTINUOUS DOMAIN

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This paper describes the ways to maintain the consistency in Multiplayer Online Games (MPOGs) in continuous domain. The involvement of computer networking, computer graphics, multimedia, and artificial intelligence makes the MPOG environment more complex. As a result, consistency, responsiveness, scalability, fairness and avoiding cheating are examples for available issues in MPOG environment. The consistency is well discussed in the discrete domain, however the attention on consistency of MPOGs in continuous domain is poor and data centric approaches are not adequate for MPOGs as the game state changes with passing time. Further, the consistency and responsiveness are two important considerations in MPOG environment; however both cannot be achieved at once. As

a result, different architectures are available to implement game environment, and they are supported by latency handling techniques; time delay, local lag, time wrap, progressive slow down, dead reckoning, gossiping, PREMUB for example. Examples are discussed under each architecture for better understanding the criticisms of architectures. This paper mainly delivers the importance of consistency in MPOG, however it sacrifices the responsiveness in MPOG, as a result both aspect must be considered in an equally important manner for Quality of Experience (QoE) of the player.

**Keywords:** Consistency, Responsiveness, MPOG, latency compensation, QoE

## REQUIREMENTS FOR AN ENGLISH-SINHALA SMART BILINGUAL DICTIONARY: A REVIEW

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The smart bilingual dictionaries become popular as the means of interactive communication between languages. Therefore, the smart bilingual dictionary can be used as a language learning tool to enhance language professional skills with a solution for the language barrier. Compared with existing traditional and electronic English-Sinhala bilingual dictionaries, most of the dictionaries give only semantics on both languages. This paper presents a review of existing English-Sinhala bilingual dictionaries with considering the today's requirements to enhance English

language skills for users who are not fluent in English language. So, in this review, it's discussed the features of the dictionaries with a comparison to existing dictionaries. Finally, it stated that the features which should be added to those existing ones to have a smart bilingual dictionary that can be used as a language learning tool.

**Keywords:** Bilingual- Dictionary, Morphology, Sinhala

## A REVIEW OF MOBILE TECHNOLOGY FOR TEACHING AND LEARNING MATHEMATICS

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Today, the claim of Mathematics is more critical than ever. Almost everything in the world is relying on mathematics. The subjects like mathematics can be known as a requisite subject of the school curriculum which is compulsory for students and cannot be ignored. Because, as it is mentioned earlier mathematics can be known as a crucial subject. There is a general opinion that most students do not like mathematics due to many reasons. However, students' dislike for mathematics may damage the collaborative other professions as well. This paper examines the reasons for students' dislike for this subject and will provide the most convenient SMART solution. The methodology used to conduct this research is qualitative and quantitative based survey. The online survey was circulated through Email, Social Media and desk research. The survey was successfully completed by 160 persons securing their secrecy. The shared questionnaire brought strength to the research

when identifying the issues. According to the previous work, the technological assistance was the main empirical result that they have suggested in order to minimize this situation. According to the online survey results more than 90% raised their flag on the difficulties that they face during calculations and other algebra by their life time experiences. With the rapid growth of technology and the interest of people towards mobile-based applications, it has been shown that mobile devices can be used as a tool to improve students' academic skills. Therefore, this paper suggests a new approach to the user, through which the user can build up an interest towards mathematics. Also, these can identify the aspects that are involved in teaching and learning of mathematics as well as the possible solutions.

**Keywords:** Mathematics, Mobile application, SMART technologies

## PERSONALIZED RECOMMENDATION SYSTEM FOR LEISURE TIME ACTIVITY USING SOCIAL MEDIA DATA

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In today's digital world wherever there's associate degree endless variety of content to be consumed like books, videos, game, movies, music, etc., finding the content of one's interest has become associate degree deadening task. A personalized recommendation system for leisure activities is vital in our social life due to its strength in providing enhanced entertainment. Our system has the ability to recommend leisure time activities, to a new user and others by using their social media data. It gathers all the important information, such as popularity, liking and disliking, required for recommendation. It also takes a minimum of new user information without connecting to social networks. It generates recommendations for the user based on his/her behaviour on social media. Such a system will counsel a group of

films, books, music, TV shows, games and places to users supported their interest and private data using Collaborative filtering and Content-based filtering. Similarity, index is measured by using Pearson Correlation and Cosine based similarity and Tanimoto Coefficient based Similarity. The planned system has the flexibility to advocate leisure activity to a brand new user furthermore because the others by mistreatment social media knowledge. It effectively reduces the complexity of the search space for users and attracts more and more users to the Internet, which increases the profits of site owners.

**Keywords:** Recommender system, Cold start user, Big data, Personalized, Hadoop

## DATA HANDLING AND MAINTAINING DATA CONSISTENCY IN SCALABLE REPLICATED MICRO-SERVICES

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Monolithic Architecture helps to develop server-side enterprise applications. But, it views as a “big ball of mud”. That indicates that monolithic architecture has many drawbacks. Introduction of cloud based micro-service architecture can solve these kinds of drawbacks. Micro-service architecture helps to scale an application. Most of the applications write less data than reading of that data. Scaling of read model and write model separately is very important. But, scaling applications using micro-service architecture is very hard. Further, applications cannot simply use a local ACID (Atomicity, Consistency, Isolation, Durability) transaction. Read part is scaling to more replicas. Thus, maintenance of the data of

all replicas in same level is important. Replication of read model and maintenance of data consistency which would provide experimental insight still need to be developed. To bridge this gap, development of an architecture based on messaging with RabbitMq publish/subscribe method, event sourcing and Command Query Responsibility Segregation (CQRS) with axon framework is used in this study. Evaluation of this architecture was done by replication of the read model using Docker and Docker-compose. Further, we have analysed data consistency in our experiments.

**Keywords:** Monolithic Architecture, Micro-service architecture, Event sourcing

## A WEB BASED PAPERLESS MEETING MANAGEMENT SYSTEM

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The university system faces many difficulties when scheduling and conducting meetings. The proposed system aims at the design and implementation of a web based paperless meeting management system for the university. The system provides a technological solution to utilize such meeting management systems. The system consists of the development of a web-based paperless meeting management system with a data table management option. The proposed system will provide meeting arrangement facility to get details of meeting or notify alternative meetings that can be used through the system. Also, this system provides a room direction map of venues and online meeting details. The participants can cancel their participation online. The attendance can be marked through Quick Response Text (QR)

which provides special section for participants to participate in the meeting. It would be beneficial to both participants as well as the university. To accomplish this, the web Based Paperless Meeting Management System (WBPMMMS) was developed with Hypertext Mark-up Language (HTML), JAVA, Android Studio, MySQL, Extensible Mark-up Language (XML), Cascading Style Sheet(CSS), Java Script and Web services Description Language (WDSL). The final outcome of this study is to overcome the issues that may occur in the process of manual meeting management.

**Keywords:** Paperless Meeting management system, Web-Based, Quick Response Text (QR)

## THE RASHOMON EFFECT ON SOFTWARE DEVELOPMENT REQUIREMENT GATHERING PROCESS

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A software project, whatever the size, must go through defined stages, which is known as the Software Development Lifecycle (SDLC). Among the five phases of the SDLC, the first phase: Requirement Definition needs certain technique to gather requirements and identify functional and non-functional specifications. When conducting a requirement gathering method naturally occur conflicts. The cause for the conflicts can be defined as: in a single occurrence can be found multiple ideas with different viewpoints. Likely this situation can be called as Rashomon Effect.

By discussing what the conflicts that occur when conducting a requirement gathering technique are and how Rashomon Effect plays on these identified problems, through this paper will discuss about effect and the relationship between Software Development Requirement Gathering Process and Rashomon Effect. Finally, this paper concludes with how to overcome the Rashomon Effect in Software Development Requirement Gathering Process.

**Keywords:** Rashomon Effect, Requirement gathering process, Interview

## IOT BASED FALLS DETECTION AND HEART ATTACK DETECTION SYSTEM FOR ADULTS: SMART WEARABLE

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In the new era of communications and technology the Internet of Things (IoT) connects devices, sensors, appliances, people, and things. The IoT can help to enhance the living style of the humans in wider area. Most importantly IoT devices will help to safe guard the living beings ever than before. Most of the elders wish to live independently at homes. Some activity in their daily life is prone to have some accidents, such as falls and heart-attacks. Falls can make people in fatal conditions, even death. Also, heart attack is a global leading cause of death for both gender of elders and the occurrence is higher than other incidences, the research is targeted to the adults who are suffering from illness and reduce the death rate of heart attack and reduce the bad effects of fallings early as possible.

The research was conducted within applied research paradigm. The intention was to develop

an IoT Based SMART wearable device. The accelerometer uses to detect the falls and GSM based wearable device is used for the notation purpose. The system will generate automatic call as an alert will be sent to family members with the location. This research also can distinguish condition of people between falls and activity doing daily works. When the system starts monitoring and as soon as patient heart beat goes above or lower a certain limit, the system sends an alert to the elder which then transmits this over the internet and alerts the doctors as well as family member. This helps to determine the problem earlier to reduce the death rate of heart attack.

**Keywords:** Internet of Things, Wearable device, HIS





