

# International Women in Engineering Symposium 2020

# Proceedings Book

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## **Message from General Chair – WIESymp 2020**



Welcome to the First International Women in Engineering Symposium (WIESymp) 2020 organized by IEEE Women in Engineering (WIE) Sri Lanka Section, being held fully virtually on 15th of November 2020. Organizing committee is very pleased to have your participation and contribution to the event. Despite the Covid-19 world pandemic, this event brings us to meet together online for the research presentation tracks, allowing virtual interaction, knowledge and innovative sharing, with regard to the potential and future developments in every disciplines of Electrical, Electronic and Computer Engineering.

The event was organized under the guidance of a reputed international advisory board and I take this opportunity to thank all our advisors. We have called for abstracts with posters under four tracks: Power and Energy, Computing and Information Technology, Robotics and Automation, and Electronics and Communication, from both local and foreign researchers. All the papers were peer reviewed by reputed international and local experts in the field. After a thorough review process of two rounds, only 65% of the submissions were accepted to be presented at the symposium.

I would like to thank our sponsors; the financial sponsors - Celyex Engineering and OREL Corporation (Pvt) Ltd, and the online platform sponsor-Learn Network. Further, I wish to express my gratitude for IEEE Sri Lanka section and IEEE R10 Women in Engineering (WIE) for collaborating with us and recognizing our work.

I congratulate the authors of the accepted papers and express my sincere thankfulness to our organizing committee members, technical program committee members and paper reviewers, as well as all involved volunteers and the members of WIESymp 2020. Their contributions have helped me in many ways to successfully deliver this event.

Welcome you to WIESymp 2020. I truly hope you will enjoy the conference and have a pleasant experience with us.

Dr. Maheshi Buddhinee Dissanayake,  
Senior Lecturer,  
Department of Electrical and Electronic Engineering,  
Faculty of Engineering, University of Peradeniya, Sri Lanka.

## **Message from the Technical Program Committee Chair – WIESymp 2020**



The International Women in Engineering Symposium (WIESymp) 2020 is a milestone of the Women in Engineering (WIE) affinity group of the IEEE Sri Lanka Section. Posters were called under four tracks namely, Computing & Information Technology, Electronics & Communication, Power & Energy, and Robotics & Automation. During the period from 1st of July to 31st of August, 2020, 47 submissions could be attracted from Australia, Taiwan, UK, Spain, Ethiopia, New Zealand and Sri Lanka and they were submitted to a single-blind review process. About 50 researchers volunteered as reviewers representing several local universities as well as foreign institutions in the USA, Japan, New Zealand and Spain, and each submission was peer reviewed by at least two reviewers. The commendable service rendered by the panel of reviewers laid the foundation for this successful chapter of the IEEE WIE Sri Lanka Section.

The Technical Program Committee (TPC) comprises eminent researchers who made a timely contribution throughout the review process in identifying relevant reviewers, coordinating with them and using their expertise to finalize acceptance. Out of the 47 submissions, only 6 submissions were accepted, 8 were rejected, and 33 were referred back for resubmission with revisions. The revised papers were assessed again by the TPC and a total of 31 papers were accepted to be presented and published. The guidance given by Prof. Janaka Ekanayake (Fellow of IEEE), the Honorary TPC chair is invaluable. The visionary leadership of Dr. Maheshi Dissanayake, The General Chair of WIESymp confidently built the pillars of this success story with the support of the dedicated Organizing Committee. The recognition awarded by the IEEE Sri Lanka Section for the symposium is appreciated, as it provided us with the encouragement for this achievement during these difficult times.

Dr. Jeevani Jayasinghe - TPC Chair/ WIESymp 2020

## **Message from the Publication Chair – WIESymp 2020**



I would like to extend a warm welcome to all participants and delegates on behalf of the publication committee, to the First International Women in Engineering Symposium (WIESymp) 2020. While we regret that the COVID pandemic prevented us from holding the symposium physically, we are excited about the opportunities of holding an innovative virtual symposium. This is the first time for the IEEE Women in Engineering (WIE) Sri Lanka Section to organize a symposium, and holding the symposium virtually will be a great opportunity for us to explore ‘New Frontiers in Early Intervention’ as well as using digital and social media during the pandemic to reach a wide audience across the world.

I would like to express my sincere appreciation to all authors of the papers in this proceeding. It is the result of their generous contribution of time and effort on engineering and technology related research. The willingness to make an effort to share knowledge and thoughtful insights with the engineering and technology community is greatly appreciated which has made this conference proceedings possible.

Our technical program is rich and varied with 1 keynote speech and around 31 technical papers split between 3 parallel oral tracks in each session. We also expect to provide technical demonstrations, and numerous networking opportunities to jointly explore current and future research directions. We hope that you will have a productive time at this very special virtual symposium.

Dr. Windhya Rankothge  
Publication Chair/ WIESymp 2020

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## **Message from Chair- IEEE Sri Lanka Section**



The first International Women in Engineering Symposium, WIESymp 2020 is organized by the Women in Engineering (WIE) affinity group of the IEEE Sri Lanka Section with the theme “Technological Advancements for Humanity”. The WIESymp 2020 aims to foster technological innovation and excellence by functioning in

agreement with the dedication of IEEE for the advancing technology for the benefit of humanity. It will provide a platform to present original and unpublished research results for researchers, scientists, engineers, technologists, and inventors. The WIESymp 2020 includes topics related to Power and Energy, Computing and Information Technology, Robotics and Automation, and Electronics and Communication.

IEEE WIE affinity group is very active in technical as well as volunteering activities. Hence, the IEEE Sri Lanka section is always willing to collaborate with them. Considering the importance of organizing a symposium in timely related theme the IEEE Sri Lanka Section recognized the WIESymp 2020. The symposium is organized as a fully virtual event by providing all expectations of a physical event. The virtual symposium runs on November 15th. The organizing committee of the WIESymp 2020 has strived to fulfil the expectations of its participants by designing its programme very carefully. 30 abstracts will be presented in technical sessions in the virtual modes during the symposium. IEEE members are entitled to the free registration of the symposium.

I am particularly thankful to the advisory committee of the symposium for their valuable suggestion and advice for the success of the event. Furthermore, I congratulate Dr. M. B. Dissanayake, General Chair of the Symposium, Prof. Janaka Ekanayake, Honorary Technical Programme Chair, Prof. Jeevani

Jayasinghe, Technical Programme Committee Chair, and their team for the excellent technical programme of the WIESymp 2020. I am confident that you will enjoy the technical programme as it will be inspiring, valuable, and exciting.

Prof. Ruwan Gopura  
Chairperson  
IEEE Sri Lanka Section

## **Message from Chair - IEEE Region 10 WIE Committee**



On behalf of IEEE Region R10 Women in Engineering Committee, I would like to congratulate the first International Women in Engineering Symposium which will be organized by IEEE Sri Lanka Section WIE. Region 10 WIE Committee promotes activities relevant to female professionals/students such as leadership skills, personal development and knowledge sharing for professional development. IEEE Sri Lanka Section WIE is one of the very active Affinity Groups in Region 10. I am delighted to know that IEEE Sri Lanka WIE always does new challenges. It is essential for women engineers and researchers to continue to learn from each other by sharing their technical expertise.

We are working hard on every day in order to realize a better future, even this very difficult COVID-19 pandemic situation. I really hope that through WIE's activities and the technical symposium, many of our members and women professionals will expand their networks, have hope for future possibilities, and work together for our better future.

Emi Yano

Women in Engineering Committee Chair 2019-2022

IEEE Region 10

## **INTERNATIONAL WOMEN IN ENGINEERING SYMPOSIUM 2020**

### *Technological Advancements for Humanity*

#### **Agenda**

09:00 - 09:10 am	Introduction and housekeeping announcement
09:10 - 09:20 am	Welcome address by Dr. Maheshi Dissanayake, Chairperson WIE SL Section
09:20 - 09:30 am	Address by Prof. Ruwan Gopura, Chair IEEE SL Section
09:30 - 09:40 am	Breakout time for parallel sessions
09:40 - 11:00 am	Parallel Sessions 01 – Track CIT 1, Track EC 1 and Track PE 1
11:00 - 11:30 am	Break
11:30 - 13:00 pm	Parallel Sessions 02 – Track CIT 2, Track EC 2 and Track PE 2 and Track CIT 3
13:00 - 13:25 pm	Lunch Break
13:25 - 13:30 pm	Joining main session
13:30 - 14:00 pm	Keynote Speech “Promoting Collaborative and Effective research through virtual environment” by Prof. Udith K. Jayasinghe
14:00 - 14:30 pm	Awards
14:30 pm	Vote of Thanks and closure

## **Computing and Information Technology 1 (CIT 1)**

**Track Chair: Dr Akmal Jahan**

**Co- Chair: Dr. Maheshi Dissanayake**

1. Vibhushinie Bentotahewa, Chaminda T E R Hewage, Jason Williams, "Gender Balance in ICT: Sri Lankan Perspective in Data Protection"
2. M.P.M. Dias, A. Udunuwara, R. Weragama, M. Senadeera, "Customer Experience Management Platform"
3. Y. Thenuka, S. Vasanthapriyan, K. Banujan, "Decision Making in Treatment Method for Subfertility of Female"
4. P. Premisha, B.T.G.S Kumara, E.P Kudavidanage, K. Banujan, "An Ontology-Based Data Mining Approach for Predicting the Research Ideas using Past Research in the Wildlife Sector of Sri Lanka"
5. Lasini C Wickramasinghe, Jeevani Jayasinghe, Upaka Rathnayake, "Artificial Neural Network Approach for Paddy Yield Prediction"

## **Computing and Information Technology 2 (CIT 2)**

**Track Chair: Prof. S. Vasanthapriyan**

**Co- Chair: Dr. Akmal Jahan**

1. Maheshi B Dissanayake, "Automating the cloud cover detection in satellite images using fully connected convolutional neural networks"
2. W.T. Ruwanga, G.M.R.I. Godaliyadda, M.P.B. Ekanayake, J.V. Wijayakulasooriya, R.M.C.J. Rathnayake, "Combining Local Non-Negative Matrix Factorization and Spectral Clustering to Detect Fetal Movements"
3. Laksala M. Balage Arachchilage, Malka N. Halgamuge, "Towards Secure IoT Industry: An Adaptive Time-Based Algorithm for Selecting Tips in the IOTA Tangle"
4. Kamalani Aiyar, Malka N. Halgamuge, "Security Estimation for Sharding Based Blockchain Networks"



5. I.D.T.T.Weerasinghe, K.P.N.Jayasena, "Multimedia Big Data Platform with a Deep Learning Approach for Flood Emergency Management in Sri Lanka
6. G. Sitparan, UA Piumi Ishanka, "Hate Speech Recognition in Tweets"

## **Computing and Information Technology 3 (CIT 3)/ Robotics and Automation (RA)**

**Track Chair: Dr. Damayanthi Herath**

**Co- Chair: Dr. Pubudu Jayasena**

1. J.G Buddhika. K.P.N Jayasena, "Fog Computing and IOT Based Prediction System for Healthcare Using Deep Learning Methods"
2. S.M.A.B.Willamuna, H.M.D.M.B.Herath, D.W.M.M.P.Wijekoon, S.M.K.S.B Egodawela, J.V. Wijayakulasooriya, I.M.S. Satyaprasad, G.M.R.I Godaliyadda, H.M.V.R Herath, M.P.B. Ekanayaka, "Vehicle Number Plate Detection Using Deep Learning Techniques"
3. M.A. Ahmed Thaajwer, U.A. Piumi Ishanka, "Melanoma Skin Cancer Detection Using Image Processing Techniques: A Systematic Literature Review"
4. Dilanka Sasindu Perera, Tharindu Ekanayake, Dinusha Nuwan Ranaweera, Maheshi B. Dissanayake, "Automated Low Complex Method for Ball Location Identifying in a Football Video"
5. T.M.I.H. Karunarathne, R.M.U.G.C.S.K. Karunarathne, H.A.K.S. Gayashan, B.G.L.T. Samaranayake, W.A.N.I. Harischandra, "2D Navigation of a Four Wheeled Omni Directional Mobile Robot in an Unknown Terrain Using SLAM"

## **Electronics and Communication 1 (EC 1)**

**Track Chair: Dr. Susantha Wijesinghe**

**Co- Chair: Dr. Ranga Rodrigo**

1. M.A.Y. Lakindu, J.T. Jayewardene, H.M.H.S. Bandara, M.B. Dissanayake, Wei- Kuang Lai, "Road Safety at Intersection Using VANET"
2. Arebu Dejen Abdela, Jaume Anguera, Jeevani Jayasinghe, Murad Ridwan, "Genetically Engineered Dualband Microstrip antenna with Improved Directivity for 5G mm-wave mobile application"
3. Shyama M Wickramasinghe, Melaka Senadeera, Jeevani Jayasinghe, "Low Power ASK Demodulator for Passive UHF RFID Tags"
4. K. Keethansana, S. Jaseetha, S. Kajeewan, Maheshi B. Dissanayake, H.M.V.R.Herath, U. S. Navaratne, "IOT Platform for Human Identification Through Walking Patterns"
5. Nimesha Naranpanawe, Jeevani Jayasinghe, Disala Uduwawala, "Design of a small high directivity printed Yagi antenna"

## **Electronics and Communication 2 (EC 2)/ Power and Energy 1 (PE 1)**

**Track Chair: Dr. Himal Suraweera**

**Co- Chair: Dr. Lidula Arachchige**

1. D.R.S.K. Wimalarathna, Y.S.P. Weerasinghe, H.K.I.S. Lakmal, "An Architecture for Transporting Event Sensing Data over ZigBee"
2. Isuru Senevirathne, Danuka Malinda, Gayan Nettasinghe, Sandalika Pabasari Weerasuriya, Tharaka Samarasinghe, "Active Road Signs"
3. Shashika Madushan<sup>1</sup>, M.W.P. Maduranga, "Design of IoT Sensor Node with Multiple Sensor Types Over ESP8266\*"

4. Sampath Ediriweera, Pramod Jayarathna, Rasara Samarasinghe, Rohan Lucas, "Effect of the Shape of the Boundary Configuration on Discharge Length and Density of Creeping Discharges"
5. Dilini Almeida, J.B. Ekanayake, "A Monte Carlo Based Approach to Assess Solar PV Impacts on LV Distribution Networks"

## **Power and Energy 2 (PE 2)**

**Track Chair: Dr. Sudeera Navarathna**

**Co- Chair: Dr. Rasara Samarasinghe**

1. Eshan Karunarathne, Anjana Wijesekera, Lilantha Samaranayake, P Binduhewa, J.B. Ekanayake, "Battery Supercapacitor Hybrid Energy Storage with a Kalman Filter Based Energy Management System"
2. Lasanthika Harshani Dissawa, J.B. Ekanayake, P Binduhewa, Lilantha Samaranayake, S Abeyratne, "Smart Distribution Management System to Mitigate Voltage Rise Occurred due to High Penetration of Solar PV in Distribution Grid"
3. Anjana Upendra Wijesekera, J.B. Ekanayake, S Abeyratne, Lilantha Samaranayake, P Binduhewa, "Development of Output voltage controller for a Smart Distribution Transformer"
4. Dulsha Kularatna-Abeywardana, "Electropermanent Magnet Driven Actuators for Bi-Stable Applications"
5. G.C. Ranasinghe, R. Wijesiriwardana, "An Empirical Model to Optimize Wind Lens Parameters"

## **Keynote: “Promoting Collaborative and Effective Research Through Virtual Environment”**

### **Speaker Profile – Snr. Prof. Udith K. Jayasinghe**

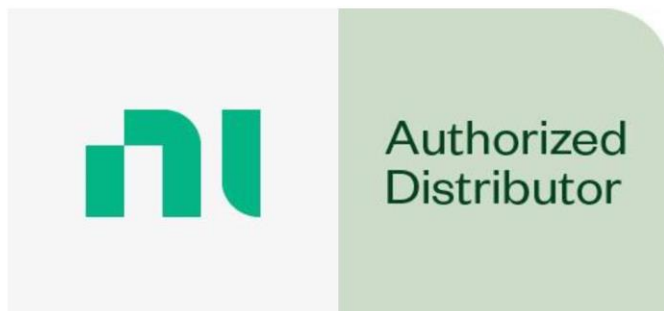


Prof. Udith K. JayasingheMudalige is the Vice-Chancellor of Wayamba University of Sri Lanka and a Senior Professor and Chair of the Department of Agribusiness Management. He obtained Bachelors’ and Masters’ from University of Peradeniya, Sri Lanka, and PhD in Agri-Food Economics and Business from University of

Guelph, Canada.

He is a recipient of the ‘Fulbright Teaching & Research Fellowship’ (USA) and ‘Endeavour Postgraduate Research Fellowship’ (Australia). Further, he is a ‘Senior Fellow of Staff & Educational Development Association’ (SFSEDA, UK), a ‘Certified Development Project Manager’ (CDPM®, USA) as well as a ‘Chartered Environmental Professional’ (CEnvP., SL).

He has served as a resource person for over 60 International/National level Grants and published over 150 articles in peer-reviewed Journals/Reports/Textbooks. Further, he has disseminated the outcomes of his research work in over 400 conferences held in locally and internationally. In recognition of his contributions/ achievements, he has been offered Membership and Life Membership in more than 20 global and local professional bodies, including IASSL, IEPSL, INSEE, NSSL, SANDEE, SAEA, SLEA, SHE, SLAAS, SLAFAR, SLAIHEE, SLAQ.



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The Lanka Education And Research Network is the NREN (National Research and Education Network) of Sri Lanka, which interconnects Educational and Research institutions across the country, and provides network related services to them. We currently interconnect all of the UGC funded state universities, a number of public universities under other ministries, the University Grants Commission, the Ministry of Higher Education, and a number of national research institutions including the National Science Foundation (NSF). We would like to convey our best wishes to the First International Women in Engineering Symposium (WIESymp) 2020 and we are delighted to contribute to this event by providing online virtual platform service as LEARN is always seeking to provide network provision related services for the betterment of Higher Education and Research community.

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📍 Level 17, Parkland Building, No. 33, Park Street, Colombo 02, Sri Lanka.

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## *Technological Advancements for Humanity*

- ✓ Power and Energy
- ✓ Computing and Information Technology
- ✓ Robotics and Automation
- ✓ Electronics and Communication



## ***Gender Balance in ICT: Sri Lankan Perspective in Data Protection***

Vibhushinie Bentotaheewa, Chaminda Hewage, Jason Williams  
Cardiff Metropolitan University (United Kingdom)

v.bentotaheewa@outlook.cardiffmet.ac.uk, chewage@cardiffmet.ac.uk,  
JJWilliams@cardiffmet.ac.uk

Sri Lanka has made impressive strides into technology revolution, and the government and private sector increasingly rely on modern Information Technology systems. However, they have also become exposed to ICT associated cyber threats, compromising national security and privacy of the citizens. The Computer Crimes Act 2007 and the (draft) National Cyber Security Bill, 2019 go some way towards addressing the issue, however, attention should also be on providing cyber awareness programs as a part of the package.

In this work authors seek to evaluate the actions the government should take to enhance the capacity of women and encourage them to take up employment in the ICT sector. The results indicate that cyber security awareness amongst men is higher than that of women, despite the relevant training the women received from their organizations. Furthermore, the key indicator is that training alone will not be sufficient and, facilitating information security awareness programs as part of the school curriculum is also important. Based on the findings, the authors suggest, SLCERT (Sri Lanka Computer Emergency Readiness Team) should work together with academics and organizations to deliver awareness programs, and where beneficial, in collaboration with similar external sources, commercial entities and academic institutions, to bring in new knowledge.

## ***Customer Experience Management Platform***

M.P.M. Dias<sup>1</sup>, A. Udunuwara<sup>2</sup>, R. Weragama<sup>2</sup>, M. Senadeera<sup>1</sup>

<sup>1</sup>Wayamba University of Sri Lanka, <sup>2</sup>Sri Lanka Telecom PLC Kandy

pubuduwusl@gmail.com, anuradhau@slt.com.lk, rajivw@slt.com.lk,  
melaka@wyb.ac.lk

Fault management plays a major role in the Telecommunication industry. An effective and efficient response to customer complaints is an essential index of organization's performance. The presented model for the CEMP has the ability to minimize customers' dissatisfaction and on the other hand it can encourage customers to participate in controlling the provided quality of the services. The customer may feel dissatisfied with the service if he or she receives a delayed response. Customers do not know where to fill the complaint, Current complaint handling in the organization still has these problems. Therefore, CEMP was proposed and implemented to solve the customer's faults. CEMP consisted both of a mobile application and a web application linking the customer to technician in the field through a management portal. Proposed system has the functionalities of fault/technician tracking, maintaining user profile, nearest technician acknowledgement and customer feedback which are beneficial to both customer and the company.

## ***Road Safety at Intersection Using VANET***

M.A.Y. Lakindu<sup>1</sup>, J.T. Jayewardene<sup>1</sup>, H.M.H.S. Bandara<sup>1</sup>, M.B. Dissanayake<sup>1</sup>,  
K. Lai<sup>2</sup>

<sup>1</sup>University of Peradeniya (Sri Lanka), <sup>2</sup>National Sun Yat-Sen University  
(Taiwan)

e14188@eng.pdn.ac.lk, jenithds@gmail.com, hmhs.bandara@gmail.com,  
maheshid@ee.pdn.ac.lk, wkilai@cse.nsysu.edu.tw

Road accidents are a major public safety concern in developing countries. Yet, most of these accidents are simply preventable with the correct measures. With the advancement of communication technology, a modern research area which focuses on vehicle to vehicle and vehicle to infrastructure communication has emerged. This technology, named Vehicular Ad Hoc Networks (VANET) is used as a platform which enables roadside communication to establish cooperation between vehicles and other roadside units, to prevent road accidents through sophisticated traffic management techniques.

In the research presented, the authors analyze the feasibility of using VANET for traffic control at intersections. The architecture presented is implemented at a roadside unit (RSU), located near the intersection. The RSU communicates with the vehicles arriving at the intersection using wireless communication units installed within the vehicles, using VANET protocols. The RSU, estimates the arrival time and order of arrival at the intersection by simply analyzing the vehicle speed and the distance to the intersection. Since the presented algorithm is simple, the processing time is fast and response time is quick. Thereby it communicates fast responses to incoming vehicles with instructions on how to approach and cross the intersection, preventing traffic accidents due to bad judgments.

## ***Genetically Engineered Dual-band Microstrip Antenna with Improved Directivity for 5G mm-wave Mobile Applications***

Arebu Dejen<sup>1</sup>, Jaume Anguera<sup>2,3</sup>, Murad Ridwan<sup>1</sup>, Jeevani Jayasinghe<sup>4</sup>  
<sup>1</sup>Addis Ababa University (Ethiopia), <sup>2</sup>Fractus Antennas (Spain), <sup>3</sup>Universitat Ramon LLull (Spain), <sup>4</sup>Wayamba University of Sri Lanka

arbdjn@gmail.com, jaume.anguera@salle.url.edu, murad.ridwan@aait.edu.et, jeevani@wyb.ac.lk

The higher data rate and the ever-increasing service requirements of a mobile device demands a suitable and efficient antenna technology for operation at upcoming mm-wave mobile communication. High directive and multiband antennas with efficient performance are suitable for increasing the spectrum efficiency, providing higher data rates, and adequate reasonable coverage for mobile broadband services in a compact size by overcoming some of the challenging propagation characteristics of mm-waves. This paper presents directivity improvement of a dual-band microstrip antenna for mm-wave mobile applications by using genetic algorithm optimization. The patch geometry was divided into 64 cells, where the cells were assigned conducting and non-conducting properties by binary coded genetic algorithm. The optimized geometry has been simulated in HFSS. The optimized antenna resonates at 28.0 GHz and 46.6 GHz having a  $S_{11} < -10$ dB bandwidth of 1.8% and 1.5% respectively. It exhibits a broadside radiation pattern with directivity of 8.4 dB and 9.0 dB at 28.0 GHz and 46.6 GHz respectively.

## ***Decision Making in Treatment Method for Subfertility of Female***

Y. Thenuka, S. Vasanthapriyan, K. Banujan  
Sabaragamuwa University of Sri Lanka

thenuka94@gmail.com, priyan@appsc.sab.ac.lk, bhakuha@appsc.sab.ac.lk

Abstract Decision making in treatment method of subfertility of females is the vast area than the male subfertility in the gynecological section. Information technology-based decision making helps doctors, nurses and medical students to increase the quality of service for their subfertility patients in their routine work, studies and further research. It assists to find the causes and actual treatment method as recommended by using the current medical status of the patients. Ontology is selected because it suits for encapsulating the term of concepts and their relationship and specifying modeling primitives. Domain knowledge for subfertility of females is gained from doctors and medical students. Protégé Ontology Editor 5.5 is used to implement the terms and concepts in subfertility of females. Evaluation of developed ontology evaluated by ontology experts, OOPS, DL Query and SPARQL Queries tools. We planned to enhance the female subfertility decision making and develop a decision support system.

## ***An Ontology-Based Data Mining Approach for Predicting the Research Ideas using Past Research in the Wildlife Sector of Sri Lanka***

P. Premisha, BTGS Kumara, EP Kudavidanage, K. Banujan  
Sabaragamuwa University of Sri Lanka

ppremisha@std.appsc.sab.ac.lk, kumara@appsc.sab.ac.lk,  
enoka@appsc.sab.ac.lk, bhakuha@appsc.sab.ac.lk

Despite geological, socio-economic, and cultural factors, Sri Lanka is a regional biodiversity hotspot. However, Sri Lanka's wildlife is critically endangered due to a number of factors, primarily human activities and dire conservation measures required. Inadequate knowledge and technical support also hinder wildlife management activities. Findings of wildlife research studies could be integrated into data-driven conservation and management decisions, but the current contribution is not satisfactory. This research work shows a novel data mining approach for finding hidden keywords and automatic labelling for past research work in this domain. We used Latent Dirichlet Allocation (LDA) algorithms to model topics, and we also built an ontology model to represent the relationships between each keyword. These approaches are also useful for future research proposals, for recognizing research gaps and for classifying the subjects related to a publication by non-professional related fields. The experiment results demonstrate the validity and efficiency of the proposed method.

## ***Low Power ASK Demodulator for Passive UHF RFID Tags***

Shyama Wickramasinghe, Melaka Senadeera, Jeevani Jayasinghe  
Wayamba University of Sri Lanka

shyama@wyb.ac.lk, melaka@wyb.ac.lk, jeevani@wyb.ac.lk

In this paper, design of a low power Amplitude Shift Keying (ASK) demodulator for passive Ultra High Frequency (UHF) Radio Frequency Identification (RFID) tag compatible with EPCglobal Class-1 Generation-2 standard (EPCglobal C1G2) is presented. The proposed demodulation circuit contains a voltage multiplier, an envelope detector, a low pass filter and an average detector. A key design challenge in the passive RFID tag is its power budget. Passive tags are powered by the energy harvested from the reader. Hence, the design of a high-efficiency front end tag circuit is a crucial factor. This study proposes a voltage multiplier circuit based on the Dickson Charge Pump (DCP) topology. The design parameters of the remaining circuits are also discussed in optimizing the output.

## ***Artificial Neural Network Approach for Paddy Yield Prediction***

Lasini Wickramasinghe<sup>1</sup>, Jeevani Jayasinghe<sup>1</sup>, Upaka Rathnayake<sup>2</sup>

<sup>1</sup>Wayamba University of Sri Lanka, <sup>2</sup>Sri Lanka Institute of Information Technology

lasini2013@gmail.com, jeevani@wyb.ac.lk, upakasanjeewa@gmail.com

Rice is the dominant agricultural food in most of the Asian countries, including Sri Lanka. It is well-known that climate variation highly impacts paddy cultivation. Therefore, understanding the relationships between climatic factors and paddy yield are useful in numerous aspects. This study showcases an Artificial Neural Network (ANN) framework that can be used to model the relationships between climatic components and the paddy yield by using paddy harvesting data of the North-Western province, which is the third most paddy-producing region in Sri Lanka; thus, the research has a high potential and attention. Climate factors such as rainfall, wind speeds (morning and evening), evaporation rate, sunshine hours and minimum and maximum atmospheric temperatures were considered in this study.

Results reveal the benefit of using ANN in prediction models under the validated conditions. The predicted and the measured paddy yield have an acceptable correlation; therefore, the model can be used to predict the future potential paddy yield under the projected climate data.



## ***Automated Low Complex Method for Ball Location Identifying in a Football Video***

Dilanka Sasindu Perera, Tharindu Ekanayake, Dinusha Nuwan Ranaweera,  
Maheshi B. Dissanayake  
University of Peradeniya (Sri Lanka)

sasinduperera14@gmail.com, tharindu326@gmail.com,  
dnb1654rrts@gmail.com, maheshid@ee.pdn.ac.lk

Many important events of a football match can be identified through ball tracking. Yet, it is a complex task as the physical dimension of the object of interest is considerably smaller compared to the other objects in the video frames. In literature there are few designs for this problem, most which use the latest trends in Deep Learning architecture. In our design, we present a simple image processing-based algorithm to locate, track and extract the coordinates of the ball for the entire 90mins play time. The algorithm proposed performs ground area detection, identifying the features of the ball contours, blob filtering and masks creation. Some unique techniques proposed in this algorithm are drawing thick lines around contours to clearly identify objects as a whole and using unique features of the football to identify it clearly apart from other objects.

## ***2D Navigation of a Four Wheeled Omnidirectional Mobile Robot in an Unknown Terrain Using SLAM***

T.M.I.H. Karunarathne, R.M.U.G.C.S.K. Karunarathne, H.A.K.S. Gayashan,  
B.G.L.T. Samaranayake, W.A.N.I. Harischandra  
University of Peradeniya (Sri Lanka)

e14174@eng.pdn.ac.lk, e14176@eng.pdn.ac.lk, e14105@eng.pdn.ac.lk,  
lilantha@eng.pdn.ac.lk, nalin@ee.pdn.ac.lk

Simultaneous Localization and Mapping is a problem where a moving object needs to build a map of an unknown environment, while simultaneously calculating its position within the map. This method is still developing and practicing in the autonomous vehicle industry, mining industry, rescuing operations, underwater explorations, and planetary explorations. Different types of solutions to the SLAM problem are available such as EKF SLAM, Fast SLAM and Graph SLAM based on the applications and the cost.

The context of this project includes a brief introduction to the SLAM problem, a mathematical model to solve the SLAM problem and finally the simulation and implementation results using a four wheeled omnidirectional mobile robot, a LIDAR sensor and the ROS software. The main contribution to the industry throughout this project was analyzing the SLAM techniques for a four wheeled omnidirectional mobile robot, observing the differences and accuracy level of the results with the robot compared to the other robots and finally proposing the methods and techniques to improve the accuracy level. Some of them focus on modeling external effects and providing solutions to problems such as the loop closure and the robot stability.

## ***IOT Platform for Human Identification Through Walking Patterns***

K. Keethansana, S. Jaseetha, S. Kajeewan, Maheshi B. Dissanayake,  
H.M.V.R.Herath, U. S. Navaratne  
University of Peradeniya (Sri Lanka)

keetha0925@gmail.com, jaseenathan@gmail.com, kajeew.selva@gmail.com,  
mahesid@ee.pdn.ac.lk, vijitha@eng.pdn.ac.lk, sudheera@ee.pdn.ac.lk

Identification of an individual is a very important task in various bio-security applications. Each individual can be differentiated by using various techniques such as face recognition, speech recognition, fingerprint recognition etc. Walking pattern analysis for human recognition is an emerging novel concept, since it is a unique behavioural fact of a person, which is difficult to replicate by another. In this research we present a platform for human walking pattern collection and storage. The collected patterns can be further analysed using machine learning algorithms such as linear regression, Support Vector Machine (SVM), Decision Tree and K-Nearest Neighbour (KNN) algorithms to correctly identify individuals. In our work presented, human walking patterns were collected through a piezoelectric sensor fitted on a wooden platform. Test subjects were requested to walk on the wooden platform and vibration patterns were captured through piezoelectric sensors and converted to electrical signals. Walking patterns of 11 test subjects were recorded and eleven appropriate features in both time and frequency domain were considered to develop the model. Features were visualized using boxplots and high deviation samples were removed. Later the fine-tuned feature matrix will be further analysed using machine learning techniques.

## ***Automating the Cloud Cover Detection in Satellite Images Using Fully Connected Convolutional Neural Networks***

Maheshi B Dissanayake  
University of Peradeniya (Sri Lanka)

maheshid@eng.pdn.ac.lk

Cloud, which is a mass of condensed water vapours, flying above the ground level can act as noise in satellite images. Hence, it is essential to detect and classify cloudy regions in satellite images. Yet, it is challenging as the density of the cloud can vary from place to place and time to time. In this research we present a CNN based classification model, which classifies predefined segments of an image as cloudy or not cloudy. As the first step satellite images are segmented into predefined segment size to reduce the complexity of the model tuning. Manually labelled dataset with two classes, namely, cloud and no cloud, with roughly 1500 images were generated, and employed for model fitting and evaluation. It should be noted that this dataset is slightly imbalanced. Hence, measures were taken to avoid the over fitting, due to imbalanced data. The trained CovNet model is able to correctly classify an input image with average validation accuracy of 94%. Hence, it can be employed in applications where cloud cover needs to be analysed or filtered automatically.

## ***Effect of the Shape of the Boundary Configuration on Discharge Length and Density of Creeping Discharges***

Sampath Ediriweera<sup>1,2</sup>, Pramod Jayarathna<sup>2</sup>,  
Rasara Samarasinghe<sup>2</sup>, Rohan Lucas<sup>2</sup>

<sup>1</sup>Wayamba University of Sri Lanka, <sup>2</sup>University of Moratuwa (Sri Lanka)

ediriweera.sampath@gmail.com, pramodjayarathna@gmail.com,  
rasaras@uom.lk, lucas@uom.lk

This paper is focused to provide a theoretical background on the creeping discharge propagation over square cross-section and circular cross-section insulating material samples. A simple algorithm is used to simulate the creeping discharges on a 2-dimensional lattice grid with square boundary and circular boundary configuration. The area enclosed by these two boundaries represents the interfaces of solid insulating samples with square and circular cross-sections. These configurations are used to find out the effect of the cross section of the solid insulating material on the discharge length and discharge density. The results show that the boundary configuration does not have a significant effect on the discharge density in contrast to the discharge length.

## ***Combining Local Non-Negative Matrix Factorization and Spectral Clustering to Detect Fetal Movements***

W.T. Ruwanga, G.M.R.I. Godaliyadda, M.P.B. Ekanayake,  
J.V. Wijayakulasooriya, R.M.C.J. Rathnayake  
University of Peradeniya (Sri Lanka)

thanushiwithanage@eng.pdn.ac.lk, roshangodd@ee.pdn.ac.lk,  
mpb.ekanayake@ee.pdn.ac.lk, jan@ee.pdn.ac.lk, chathura67@hotmail.com

Fetal movement detection has been a challenging task in Obstetrics due to a limited number of available techniques as ultrasound and MRI scans, which should be performed under the clinical environment with high cost and risk of posing a health threat to the mother and the baby. Fetal movement counting by mother's perception is a standard procedure to ensure fetal well-being to prevent adverse scenarios as fetal morbidity and stillbirth. There are several efforts in trying to develop sensor units ensuring noninvasiveness together with basic signal processing techniques to identify fetuses moving inside the womb addressing the above matter. Still, the results of those studies have not been up to the standard for public usage. This study focuses on developing an optimum algorithm to detect fetal kicks from other interferences like mothers' laughs and general breathing movements. For that, the local non-negative matrix factorization followed by spectral clustering was applied for the accelerometric signal extracted from the surface of the mother's abdomen. Results demonstrate that with the use of the abundance matrix from NMF, the proposed algorithm can detect fetal kicks with an average of 90% accuracy.

## ***Security Estimation for Sharding Based Blockchain Networks***

Kamalani Aiyar<sup>1</sup>, Malka N. Halgamuge<sup>2</sup>

<sup>1</sup>Charles Sturt University (Australia), <sup>2</sup>The University of Melbourne (Australia)

kamalanikehan@gmail.com, malka.nisha@unimelb.edu.au

Improving the scalability of blockchain networks has taken huge attention in recent years. Sharding is considered to be the most promising method to do that. Sharding divides blockchain into several shards or committees that process transactions separately than processing as a whole. However, this way of increasing the scalability compromises the security of blockchain networks. Therefore, we propose an estimation model to analyze the security of sharding based blockchains. Our contribution is to find the upper bounds of failure probabilities of sharding based blockchain networks. For that, we use the upper-bounded hypergeometric distribution function. The failure bounds are generated for shards and blockchain epochs separately. We use Chebychev's bound to evaluate the effectiveness of our estimation model. We validate our estimation model using well-known sharding protocols named Zilliqa, Harmony, OmniLedger, Elastico, and RapidChain. Moreover, this research work aims to come up with the optimal number of shards for a blockchain to be secured by analyzing the failure probability with the number of shards in blockchain networks. Finally, we come up with several suggestions opening the doors for future researchers to enhance the security of sharding based blockchain networks.

## ***Towards Secure IoT Industry: An Adaptive Time-Based Algorithm for Selecting Tips in the IOTA Tangle***

Laksala M. Balage Arachchilage<sup>1</sup>, Malka N. Halgamuge<sup>2</sup>

<sup>1</sup>Charles Sturt University (Australia), <sup>2</sup>The University of Melbourne (Australia)

laksalamadhushani@gmail.com, malka.nisha@unimelb.edu.au

The Internet of Things Application (IOTA) is another invention of Blockchain technology and IoT platforms based on the primary factor of Tangle network. A significant factor of this an Adaptive Time-Based Algorithm is how to select tips into the IOTA Tangle Blockchain to increase the accuracy and the efficiency of Tangle using less computation power. This paper aims to develop the time-based mechanism to select the next qualified tip in a tangle network based on transaction time and cumulative weight. This algorithm is the further development of the weighted random walk algorithm based on the transaction's cumulative weight. The proposed algorithm differs from the weighted random walk algorithm because we used a high percentage of cumulative weight and a low percentage of transaction time. The transaction time of tip is calculated based on a combination of six factors. Further, we demonstrate how to select two existing transactions to validate new tip according to cumulative weight and time frame. This algorithm differs from the weighted random walk algorithm because the walker starts the walk from the opposite direction from the Genesis (Right to Left). The key feature of this study is one tip qualified to join with Tangle based on cumulative weight and transaction time. Transaction time plays a significant role in this mechanism because the cumulative weight of the several tips can be the same. However, based on transaction time, those tips are variants from each other.



## ***A Monte Carlo Based Approach to Assess Solar PV Impacts on LV Distribution Networks***

Dilini Almeida, Janaka Ekanayake  
University of Peradeniya (Sri Lanka)

dilini.almeida2@gmail.com, jbe@ee.pdn.ac.lk

The rapid penetration of rooftop solar photovoltaic (PV) systems on low voltage distribution networks (LVDN) imposes various implications on network operations. Therefore, this study proposes a Monte Carlo based probabilistic framework to assess solar PV impacts on LVDNs. The uncertainties related to PV installation capacity, location, distribution across different phases, as well as the irradiance profile that specifically influence the PV power generation were considered for the implementation of the probabilistic framework. A case study was conducted for a typical residential LVDN in Sri Lanka using a three-phase, four-wire model developed in Open Distribution System Simulator (OpenDSS) software. Time-series, high resolution (minute by minute) daily power flow simulations were performed to investigate the potential impacts of solar PV on the LVDN. The PV penetration varied from 0% to 100% in steps of 10%, and a total of 3000 Monte Carlo simulations (100 per each penetration level) were carried out for unique PV deployment scenarios using three different irradiance profiles. The impact metrics such as voltage and thermal limit (line and transformer loading) violations, voltage unbalances, and network losses were used to quantify the impacts under each penetration level. Results reveal that voltage rise and voltage unbalances are two of the worst repercussions of high solar PV integration in the future Sri Lankan LVDNs.

## ***Battery Supercapacitor Hybrid Energy Storage with a Kalman Filter-Based Energy Management System***

Eshan Karunarathne, Anjana Wijesekera, Lilantha Samaranayake, Prabath Binduhewa, Janaka Ekanayake  
University of Peradeniya (Sri Lanka)

Eshkaru16@gmail.com, drckanjan@gmail.com, lilantha@eng.pdn.ac.lk,  
prabathb@ee.pdn.ac.lk, jbe@ee.pdn.ac.lk

The battery is the only power source in an electrical vehicle (EV) that suffers from the power density shortage and encounters numerous power requirements under different scenarios in a drive cycle. Thus, this is the key determinant factor behind the reduced mileage and the lifetime of an EV. This research work demonstrates an experimental analysis of a full-active hybrid energy storage system (HESS) composed of a lead-acid battery pack and a supercapacitor pack for a lightweight electric vehicle. A pragmatic technique for an online energy management system (EMS) is suggested focusing on the Kalman filter. The major benefit of the suggested EMS is the power splitting methodology, which eliminates the current surges of the battery in both traction and regeneration time spans and shifts all the high gradient motor current demands to the supercapacitor. A full-scale experimental platform with two bi-directional converters each rated 5 kW is implemented into a common vehicle in urban areas in Sri Lanka. The setup is tested on an obtained drive cycle of 100 seconds and results reveal the complete isolation of frequent current surges from the battery current and a gain of 6% of battery SOC improvement compared to the standard EV without a supercapacitor for the drive cycle. Furthermore, the findings of the proposed HESS with the robust and real-time EMS indicate the capability of preserving battery life.

## ***Design of a Small High Directivity Printed Yagi Antenna***

Nimesha Narampanawe<sup>1,2</sup>, Disala Uduwawala<sup>1</sup>, Jeevani Jayasinghe<sup>2</sup>

<sup>1</sup>University of Peradeniya (Sri Lanka), <sup>2</sup>Wayamba University of Sri Lanka

nimeshanaranpanawe@gmail.com, disala@ee.pdn.ac.lk, jeevani@wyb.ac.lk

This paper presents the design of Yagi antennas operating at the industrial, scientific, and medical (ISM) band with high directivity. First, an elementary dipole antenna composed of five dipoles was designed. Then a microstrip line printed antenna was designed for the same frequency of operation. The size of the printed antenna is approximately 1/100 of the conventional dipole antenna. Both antennas were simulated in HFSS and performances were compared in terms of the resonant behavior, gain and size of the antennas. The Printed antenna was fabricated on a FR-4 substrate to validate the simulation results. Further, the performance of the printed antenna was compared with a rectangular-shaped microstrip antenna. Though it is quite similar to the size of the printed Yagi antenna, it exhibits narrowband bandwidth and low gain showing inherent drawbacks of microstrip patch antennas. The proposed printed Yagi antenna resonates at the ISM band having a wide bandwidth of 1.5 GHz and a directivity of 11 dB showing high directivity performance.

## ***Multimedia Big Data Platform with a Deep Learning Approach for Flood Emergency Management in Sri Lanka***

I.D.T.T.Weerasinghe, K.P.N.Jayasena  
Sabaragamuwa University of Sri Lanka

idttweerasinghe@std.appsc.sab.ac.lk, pubudu.nuwanthika@gmail.com

Disaster is a global challenge that all communities are in a vulnerable state of being affected from both natural and man-made disasters. Floods, cyclones, landslides, earthquakes, and droughts are some natural disaster and terrorism, and bomb blasts are some of man-made disaster. Among them floods are major contributors to disruption of human lives, economy, and property damage, and may also strike with little warning or prediction. Multimedia big data which are generated from computers, satellite, and sensor networks, at present crowdsourcing and social media can be used to reveal floods in advance to avoid direct consequences on the local economy. Recent developments in the collection, analysis, and visualization of multimedia data have led to a significant enhancement in flood disaster management systems. As they are existing as the huge amount of data collection, the proposed method has a capability to handle big data. Hence, this study is focused on identifying flood impact levels using images. It uses available deep learning models called VGG16, VGG19 and MobileNet models and compares its performance. Dataset comprises over 1500 images and it has categorized into high risk, medium risk, and low risk. MobileNet models perform high accuracy and it is 89%.

## ***Smart Distribution Management System to Mitigate Voltage Rise Occurred due to High Penetration of Solar PV in Distribution Grid***

Lasanthika Dissawa, J. B. Ekanayake, P. J. Binduhewa,  
L. Samaranayake, S. Abeyratne  
University of Peradeniya (Sri Lanka)

lhddm993@uowmail.edu.au, ekanayakej@cardiff.ac.uk, prabathb@ee.pdn.ac.lk,  
lilantha.samaranayake@gmail.com, sunil@ee.pdn.ac.lk

Solar photovoltaic (PV) generation continues to be a viable alternative in the overall generation mix in many countries around the world. Although this is the case, due to the intermittent nature of the PV generation, the increased penetration levels of installed rooftop PV systems can lead to over-voltage issues in distribution grids. To mitigate this issue, voltage control on the distribution network is required. This can be achieved through control of Reactive Power Compensators (VAR-C), On-Load Tap Changers (OLTC) and Solid-State Transformers (SSTs) etc. Considering the reactive power controlling capability of smart inverter and voltage controlling capability of smart distribution transformer, this research work presents a smart distribution management system for smart transformers for regulating the over voltage in distribution grid. Based on the simulation results, using the proposed s-DMS with the smart inverters and smart distribution transformers, the voltage rise problem caused due to the high penetration of solar PV in the distribution grid can be mitigated.

## ***An Architecture for Transporting Event Sensing Data over ZigBee***

D.R.S.K. Wimalarathna, Y.S.P. Weerasinghe, H.K.I.S. Lakmal  
National Engineering Research and Development Center of Sri Lanka

samila@nerdc.lk, praveen@nerdc.lk, lakmal@nerdc.lk

The automated information systems (AIS) delineated as the assemblage of hardware, software, firmware, or any combination of these, configured to accomplish specific information-handling tasks. In the context of information collection, wireless data transferring provides a powerful consortium of distributed sensor data. The research presents an architecture for AIS for the collection of data over an unguided transfer tactic. For the development purpose, a low-cost communication module based on standard protocol ZigBee (IEEE 802.15.4) was used with a microcontroller. When managing large scale even sensing data, it is highly advantageous to use protocol standardization. The architecture implemented on the network was simple and reliable to maintain a low buffer size on IEEE 802.15.4 serial buffer, with reliable data transferring. The Data frame sent by the sender consists of 24-bit holding information on car park slot occupancy and sender ID. Once data is received by the receiver, the receiver sends a data receipt confirmation signal back to the sender. Accordingly, microcontroller-based sensor data transfer architecture was developed and applied to test for the project “Smart Park Monitoring System” with ZigBee in the physical and media access (MAC) layer. This architecture is developed using an open-source platform with a standardized protocol and can be used for inaccessible places

## ***Development of Output Voltage Controller for a Smart Distribution Transformer***

Anjana Wijesekera, Janaka Ekanayake, Sunil Abeyratne, Lilantha Samaranayake, Prabath Binduhewa  
University of Peradeniya (Sri Lanka)

anjana.w@ieee.org, jbe@ee.pdn.ac.lk, sunil@ee.pdn.ac.lk,  
lilantha@eng.pdn.ac.lk, prabathb@ee.pdn.ac.lk

The global electrical energy demand is constantly growing over many decades and recently, renewable energy sources are progressively becoming a significant contributor to meet power demand. Photovoltaic (PV) is one of the major sources of renewable energy, and implementation cost is considerably reduced due to the competitive market share, government support and advanced technologies. As a result, along with large-scale PV installation, roof-top domestic PV systems connected to the Low Voltage Distribution Network (LV-DN) have become more popular. However, high PV penetration on the grid brings up issues in the system's voltage and frequency, due to the intermittent nature of PV. Therefore, active, and continuous regulation of voltage and frequency becomes challenging. Using Reactive Power Compensators (VAR-C), Dynamic Voltage Restorer (DVR), Hybrid (On-Load Tap Changers) OLTC and Solid-State Transformers (SSTs) are the voltage control methods and usage of energy storages, maintaining reserve margins, Demand Side Management (DSM) systems and Conservation Voltage Reduction (CVR) are frequency control methods that are widely used. However, these voltage and frequency control methods have many drawbacks in terms of the cost and effectiveness on distribution networks because of dedicated additional device requirements apart from the distribution transformer. Therefore, to overcome the drawbacks of the existing approaches, a distribution transformer capable of active voltage regulation along with frequency control has developed in this research work.

## ***Active Road Signs***

Isuru Senevirathne, Danuka Malinda, Gayan Nettasinghe, Sandalika

Weerasuriya, Tharaka Samarasinghe

University of Moratuwa (Sri Lanka)

isuruthiwa@gmail.com, danukamalinda6@gmail.com, gayannagc@gmail.com,

sandalika.w@gmail.com, tharaka@ent.mrt.ac.lk

Active road signs use communication technologies to improve safety, save time and increase mindfulness about the dangers on the road. The main purpose of active road signs is to transmit information related to road signs and display them to a driver on a mobile device. The system is capable of warning drivers about static road signs and situations such as changing traffic lights, dangerous bends, and slippery roads.

Establishing the local communication with vehicles travelling at high speeds is the most challenging part in this project. Although there are many concepts such as Dedicated Short-Range Communication (DSRC) and Long-Term Evolution (LTE) Direct, made specifically for vehicular communications, drawbacks such as high device cost and spectrum unavailability has forced us to look for alternative methods. In this research, the capability of Wireless Fidelity (Wi-Fi) technology to work in vehicular communications along with LTE is thoroughly tested due to the advantages of lower cost, device availability and radio spectrum availability of these technologies. Critical communication parameters related vehicular communication will be evaluated with respect to the proposed system, such as delay, latency, message size, signal range etc. An Android mobile application is developed to act as the in-vehicle Wi-Fi receiver to get data from local communication and inform the driver by displaying alerts or issuing voice commands.

Drivers will benefit from this work because they can avoid accidents and traffic violations without requiring expensive equipment upgrades. Pedestrians will benefit indirectly due to improved road safety. Authorities can improve the transportation system while reducing the cost of installation of road signs. Autonomous vehicles can get information about road signs efficiently without the need for machine vision technologies.



## ***Hate Speech Recognition in tweets***

G. Sitparan, UA Piumi Ishanka  
Sabaragamuwa University of Sri Lanka

gsitparan@std.appsc.sab.ac.lk, ishankauap@appsc.sab.ac.lk

Hate speech is becoming more and more prevalent on social media these days. This is especially common on twitter. In this paper to classify whether the text in the sentence contains elements of hate speech or not. Here we used different feature extraction methods and different classification methods to compare the accuracy with each other and it briefly describes the step of how to detect the hate speech from tweets. There are four major phases used here for the classification, they are data collection and data analysis, data pre-processing, feature extraction and classification. Here we have used Naive Bayes Algorithm and Logistic Regression Algorithm with different features. We believe in this paper can make how to classify elements of hate speech in the text by a computer, which later speech of hate can be recognized. After the creation of this program, it is hoped the computer can know and classify the existence of hate speech in the sentence.

## ***Fog Computing and IoT based Prediction System for HealthCare using Deep Learning Methods***

J.G Buddhika. K.P.N Jayasena  
Sabaragamuwa University of Sri Lanka

pbgaya1993@gmail.com, pubudu@appsc.sab.ac.lk

Cloud computing delivers an essential tool to support a huge range of applications over the Internet. The key problems of the cloud architectures are their minimal scalability, low latency, availability, network capacity and privacy to satisfy the needs of unified computing systems dependent on the Internet of Things (IoT). A modern computational model called Fog computing provides a low latency and energy efficient approach to address cloud computing challenges. In our research we introduced fog computing based new architecture with an ensemble deep learning method to automatically analyze heart disease. This architecture provides health care with IoT devices as a fog service and handles heart patient data which is effectively captured as user requests. We evaluate the performance of the Fog architecture by measuring the arbitration time, Latency time, Execution time. Those evaluations parameters are captured by increasing the number of Fog nodes and with Cloud architecture. We did the experiment for different fog scenarios (Broker only, One worker node and cloud only). In this research Cloud only, approach has very low execution time due to higher resource availability, high latency time and low arbitration time. Master node with 1 Edge node has the higher Arbitration time and low latency.

## ***Vehicle Number Plate Recognition Using Deep Learning Techniques***

S.M.A.B.Willamuna, H.M.D.M.B.Herath, D.W.M.M.P.Wijekoon,  
S.M.K.S.B Egodawela, J.V. Wijayakulasooriya, I.M.S. Satyaprasad,  
G.M.R.I Godaliyadda, H.M.V.R Herath, M.P.B. Ekanayaka  
University of Peradeniya (Sri Lanka)

anu321willamuna@gmail.com, dushan.herath123@gmail.com,  
mabeesharj@gmail.com, shamendrae@gmail.com, janadarshana@gmail.com,  
imss@pdn.ac.lk, roshangodaliyadda777@gmail.com,  
vrherath@gmail.com, mpb.ekanayake@gmail.com

One of the trending topics in the intelligent traffic system is Autonomous Number Plate Recognition (ANPR). ANPR systems have numerous industrial applications. ANPR systems can be used to identify traffic patterns which will be useful for traffic and highway engineering. ANPR systems can also be used for autonomous parking systems, highway toll systems and traffic monitoring systems. Implementation of an ANPR system in a toll or parking system has the potential to reduce manpower and increase efficiency. Furthermore, ANPR systems can be used to track vehicles, to control security in restricted areas and to enforce traffic laws.

In general, ANPR models detect number plates by features of the number plate. Number plate recognition can be divided into four sections. Namely, image acquisition, localization, character segmentation and character identification. This poster presents the study of the application of deep learning techniques for number plate recognition. The approach presented here is significant due to the character segmentation algorithm which was implemented. Classical image processing techniques were used for the character segmentation. 350 samples were analyzed using the developed ANPR model. The accuracy of the model was 85%.

## ***Melanoma Skin Cancer Detection Using Image Processing Techniques: A Systematic Literature Review***

M.A. Ahmed Thaaajwer, U.A. Piumi Ishanka  
Sabaragamuwa University of Sri Lanka

maathaajwer@std.appsc.sab.ac.lk, ishankauap@appsc.sab.ac.lk

Melanoma is the deadliest type of skin cancer. Yet it is still the most treatable, with an early-stage melanoma cure rate of almost 100%. Therefore, developing computer-aided diagnostic systems to facilitate the early detection of melanoma with higher accuracy is needed. The purpose of this study is to review and collect the research findings that have been conducted an automated melanoma detection using image processing and to assess the quality of evidence for the detection accuracy of these techniques. Here more than six databases (IEEE Xplore, Springer Link, Research gate etc.) were searched to identify the related studies. Related forty related studies were reviewed. Sixteen models were analyzed and filtered out. All these sixteen studies were conducted by following the steps image preprocessing, segmentation, feature extraction and classification with various techniques. The overall melanoma detection accuracy of the classifiers was high, with accuracies ranging from 75% to 99%. Most of the studies had substantial methodological limitations, but several were robustly designed and presented with a high level of evidence.

## ***An Empirical Model to Optimize Wind Lens Parameters***

G.C. Ranasinghe, R. Wijesiriwardana  
University of Moratuwa (Sri Lanka)

githmicranasinghe@gmail.com, rwijesiriwardana@uom.lk

Wind power generation is proportional to the third power of wind speed. The speeds at the blades are further increased by using Wind Lenses. A wind lens turbine can generate 2–5 times, the power of an existing wind turbine for a given rotor diameter and the incoming wind speed. This study is focusing on optimizing the wind lens parameters, including length and the tapering angle of the wind lens to get the maximum efficiency for a given wind turbine. A wind lens was simulated inside a controlled volume by using an open form numerical Computer Fluid Dynamics (CFD) software to get velocities at different parameters and an empirical model was developed using linear factor analysis by using the wind lens simulated inside a controlled volume.

## ***Design of IoT Sensor Node with Multiple Sensor Types Over ESP8266\****

Shashika Madushan<sup>1</sup>, M.W.P. Maduranga<sup>2</sup>

<sup>1</sup>University of Vocational Technology (Sri Lanka), <sup>2</sup>General Sir John Kotelawala Defense University (Sri Lanka)

shashikamadushan0220@gmail.com<sup>1</sup>, pasanwellalage@kdu.ac.lk<sup>2</sup>

This paper presents a design and implementation of an IoT sensor node which can be used for many applications such as smart agriculture, smart city, etc. Sensor nodes are designed on a low-cost Wi-Fi-based ESP8266 platform which enables the IEEE 802.11n protocol. In this work, we have used two NodeMCU modules (ESP8266) which are easily programmable. NodeMCU acts as a sensor node that can be used as Access Point (AP) or as a station (STA). We used one node as an AP and another as an STA. We implemented sensor nodes with DHT 11 sensors that can measure temperature and humidity in the atmosphere. We have done a completed design for the sensor node including the Printed Circuit Boards (PCB), waterproofed Enclosures, displays, etc. All the data from sensor nodes can be monitored and recorded using a remote IoT cloud. For testing, we collected temperature and humidity data using two sensor nodes and visualized them using MATLAB.

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