ABSTRACTS OF THE PROCEEDINGS

OF

ICITR 2020

Abstracts of the Proceedings of ICITR 2020

of

5th INTERNATIONAL CONFERENCE ON
INFORMATION TECHNOLOGY RESEARCH
ICITR 2020
2nd – 4th December 2020

"TOWARDS THE NEW DIGITAL ENLIGHTENMENT"

Information Technology Research Unit
Faculty of Information Technology
University of Moratuwa
Sri Lanka.

International Conference on Information Technology Research (ICITR)
www.icitr.uom.lk

ICITR 2020, 2nd - 4th December 2020

Conference mode: Online

Conference organized by: Information Technology Research Unit,
Faculty of Information Technology,
University of Moratuwa

ISSN 2012-8662

International Conference on Information Technology Research

The 5th International Conference on Information Technology Research (ICITR 2020) to be held from 2nd to 4th December 2020. This is an annual event organized by the Information Technology Research Unit (ITRU), which is the research dissemination arm of the Faculty of Information Technology, University of Moratuwa, Sri Lanka. While we regret that the COVID-19 pandemic prevented us from holding the conference physically in the University of Moratuwa, we are excited about the opportunities of holding an innovative virtual conference.

The theme of the conference is '*Towards the New Digital Enlightenment*'. We are in a Digital Revolution and the Age of Digital Enlightenment. The main focus of this conference is to provide a forum to discuss the rapid advances being made in research and development in Digital Transformation. ICITR is a well-recognized conference in the field of Information and Communications Technology (ICT). The conference scope includes subareas of ICT including but are not limited to Web Intelligence, Network Mobility Management, Embedded Systems, Decision Making and Risk Management, Psycholinguistics and Language Processing, Cognitive Mechanisms of Decision Making, Artificial Intelligence, etc.

ICITR 2020 is technically co-sponsored by IEEE Sri Lanka Section, IEEE Computer Society of Sri Lanka (CSSL) and IEEE Robotics and Automation Society, Sri Lanka Section. All the accepted papers to the ICITR 2020 will be indexed in IEEE Xplore Database. The main sponsor of the conference is CodeGen (Pvt) Ltd. This year the conference received around 65 research papers, and 26 papers were accepted by maintaining the acceptance ratio around 42%. Papers which were not selected for full-paper publication in ICITR 2020 have been considered as short-papers for the ITRU Research Symposium 2020 with the aim of providing constructive feedback for young researchers.

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KBG Samantha, University of Moratuwa, Sri Lanka

Abstracts of the blind-reviewed full papers are included in this conference proceeding.

Message from the General Chair

B. H. Sudantha
General Chair – International Conference on Information
Technology Research (ICITR 2020)

Welcome to the University of Moratuwa and the 5th International Conference on Information Technology Research (ICITR 2020). The objective of the conference is to provide a forum for researchers worldwide to unveil their latest work in Information Technology Research. The theme of the Conference "Towards the New Digital Enlightenment" gives the direction and it covers broad spectrum of allied fields also.

Maintaining a high quality of a conference requires various levels of involvement including a well-balanced review process. This year, 65 full papers were submitted to the conference. Each paper was subject to review by at least two reviewers and finally 26 papers were selected for the conference. Some of the received papers were selected for the symposium and hope it gives initial exposure to the young researches motivating them in quality research pathways. I would like to express my sincere thanks to the reviewers for their dedicated, efficient, responsible and rigorous review process ensuring the high quality of the conference papers. And also, I should be much more thankful to authors who are sharing their research experiences in the conference of their hard work and it helps us to prepare proceedings in an excellent level.

There are two workshops organized to benefit the conference participants in various new trends and to stimulate their research experiences.

A very special thank should go to our three distinguished keynote speakers, Professor Kento Morita from Mie University, Japan; Dr. Varuna De Silva, Senior Lecturer in Machine Intelligence at Loughborough University, United Kingdom and Professor Genci Capi, Department of Mechanical Engineering, Hosei University, Tokyo, Japan. who have agreed to address the conference attendees.

I would like to thank everyone who has given his or her time, energy and ideas to assist in organizing this event, including all the members of the organizing committee, the TPC Co-Chairs, TPC members and all the reviewers, for the quality and depth of the reviews, and their sense of responsibility and responsiveness under very tight deadlines.

In particular, I would like to highlight and acknowledge the tremendous efforts of especially the Director, Information Technology Research Unit, the Editorial Board, ICITR Committees including various energetic Chairs and organizing committees of workshops and the conference, and finally our dedicated faculty staff members who gave their support and they worked tirelessly on various conference-related tasks in order to bring the conference to this level and to conquer the challengers raised due to the Covid-19 outbreak

Finally, we hope that the participants enjoy the outstanding conference program of the 5th International Conference on Information Technology Research ICITR 2020.

Wishing you all a very fruitful and rewarding conference!

Message from the Conference Chair

Dr. Sagara Sumathipala
Director – Information Technology Research Unit

It is my great honour and pleasure to welcome you to the 5th International Conference on Information Technology Research (ICITR 2020) to be held from 2nd to 4th December 2020. This is an annual event organized by the Information Technology Research Unit, Faculty of Information Technology, University of Moratuwa. While we regret that the COVID pandemic prevented us from holding the conference physically in the University of Moratuwa, we are excited about the opportunities of holding an innovative virtual conference.

This time we run the conference under the theme of '*Towards the New Digital Enlightenment*'. The conference is well recognized as a forum to discuss the rapid advances being made in research and development in Digital Transformation. The conference scope covers the whole spectrum of ICT. ICITR 2020 is technically co-sponsored by IEEE Sri Lanka Section, IEEE Computer Society of Sri Lanka (CSSL) and IEEE Robotics and Automation Society, Sri Lanka Section. All the accepted papers to the ICITR 2020 will be indexed in IEEE Xplore Database. This year we received around 65 research papers, and 26 papers were accepted by maintaining the acceptance ratio around 42%. Papers which were not selected for full-paper publication in ICITR 2020 have been considered as short-papers for the ITRU Research Symposium 2020 with the aim of providing constructive feedback for young researchers.

We wish to welcome our eminent keynote speakers: Professor Kento Morita from Mie University, Japan; Dr. Varuna De Silva, Senior Lecturer in Machine Intelligence at Loughborough University, United Kingdom and Professor Genci Capi, Department of Mechanical Engineering, Hosei University, Tokyo, Japan. This year conference offers two pre-workshops, consists of five technical sessions and a panel discussion on the topic '*The Role of Information Technology in Tomorrow's World*'. Mr. Saminda Peramaratne, Head Department of Information Technology, Faculty of Information Technology, University of Moratuwa; Mr. Nuwan Perera, Vice President Commerce, IFS R&D International Ltd; Mr. Thilan Kannangara, Manager, Digital Customer Service, Hutchison Telecommunications Lanka (Pvt) Ltd. will serve as the panel members. The panel will be moderated by the Professor Chandimal Jayawardena, Dean, Faculty of Computing, Sri Lanka Institute of Information Technology. We hope

the varied opinions and comments of these expert panellists will be undoubtedly most informative to the audience present on this day.

Our success greatly depends on many people who have worked tirelessly with us at every stage of the event. I take this opportunity to express my sincere gratitude to the conference chairs for their leadership and all committee members for their tremendous support. I must mention our deep sense of appreciation for keynote speakers, reviewers, session chairs and session co-chairs. Especially I would like to thank to all the authors of the conference proceeding for selecting our conference to publish their valuable research findings. I also extend our sincere thanks to Prof. Ruwan Gopura, Chair, IEEE Sri Lanka Section, Dr. Windhya Rankothge, Secretary, IEEE Sri Lanka Section, and Dr. Sanath Jayawardana, Senior Lecturer, University of Moratuwa for their tremendous support given to obtain the IEEE Technical Sponsorship for the conference. I wish to express my sincere gratitude to the platinum sponsor, CodeGen (Pvt) Ltd. for their generosity to keep down the costs of ICITR 2020.

Also, I would like to express our appreciation to the Professor Niranjan Gunawardene, Vice-Chancellor, University of Moratuwa, Mr B. H. Sudantha, Dean, Faculty of Information Technology, Mr. Saminda Premaratne, Head, Department of Information Technology, Dr. Thushari Silva, Head, Department of Computational Mathematics, Mrs. Sumudu Wijetunga, Head, Department of Interdisciplinary Studies for their constant support and guidance. In particular, I want to thank the Program Chair, Dr. Subha Fernando, for her wise advice and brilliant suggestions on organizing the technical program. Especially I would like to express my sincere thanks to the Conference Secretary, Dr. Thilini Piyatilake, Conference Co-Chair, Dr. Upeksha Ganegoda, Finance Chair, Dr. Isuru Manawadu and Publication Chair, Dr. Priyanga Talagala for their meticulous work in support of many conference activities. I also would like to express my sincere thanks to Mr. K. B. G. Samantha and Ms. Dulakshi Wageeshani and all the team members for their enormous cooperation in the organization of this event. They are gratefully acknowledged. Last but not least, we would like to thank all of the conference participants for active participation and inputs.

At this challenging time, I urge you all to take care, and I am sure all of you find this conference stimulating, rewarding and meaningful.

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Keynote Speakers

Session 1: Keynote Address

Professor Kento Morita
Graduate School of Engineering,
Mie University, Japan

He received B.E. (2014), M.E. (2016), and Ph.D (2019), all from University of Hyogo, Japan. From 2017 to 2019, he was a research fellow of Japan Society for the Promotion of Science (JSPS). From 2019, he is an assistant professor at Mie University, Japan. His research interest is Computer-aided Diagnosis system based on medical image analysis and machine learning. Currently, he is doing collaborative research with 3 hospitals.

Keynote Title: Medical Image Analysis for Computer-aided Diagnosis

Abstract

Medical and healthcare issues such as medical disparity, aged society, and medical expenses become a big problem in the world. ICT technologies are expected to solve some of these problems. Recently, artificial intelligence related technologies are attracting a lot of attention. Medical doctors have a big interest in such technologies to reduce workload and improve the quality of diagnosis and treatment. Therefore, there are a very large number of research themes in the medical engineering field. In this talk, I will present some collaborative research on medical image analysis based computer-aided diagnosis systems.

Session 2: Keynote Address

Dr. Varuna De Silva
Loughborough University London,
United Kingdom

He is a Senior Lecturer in Machine Intelligence at Loughborough University. He obtained his Ph.D. in video coding and communications from Center for Vision Speech and Signal Processing at University of Surrey in 2011. He has worked in 3 major European Union Funded Projects during 2010-2013. Between 2013 and 2016, Varuna worked as a senior research engineer in computer vision at Apical Ltd (Now part of ARM UK). He was appointed lecturer at Loughborough University in 2016. He currently supervises 7 Ph.D.s and 2 Postdoctoral research fellows in the area of Artificial Intelligence (Multimodal machine learning and multi-agent reinforcement learning) with a strong focus on engineering applications in driverless vehicle technology and team sports analytics.

Keynote Title: An Engineering Perspective on Artificial Intelligence: Theory, Applications and the Future

Abstract

The past two decades have demonstrated a massive growth in the development of the application of Machine Learning techniques to large scale high dimensional data. This talk will look at the developments in the domain of Artificial intelligence, in terms of Deep learning and reinforcement learning. Specifically, the talk will look from a high-level how the theoretical foundations from Information theory, computational learning theory and game theory, combined with large scale function approximators and massive amounts of computational resources have contributed to the most recent developments in AI. The state-of-the-art neural networks and their applications as deep generative models will be introduced along with developments in deep reinforcement learning and multi-agent reinforcement learning and their Engineering applications. Through real-world engineering applications in driverless vehicle technology, sports analytics, financial and epidemiological modelling the talk will discuss the limitations of the current state-of-the-art machine learning techniques, the role of advanced mathematical modelling and opportunities that lie ahead.

Session 3: Keynote Address

Professor Genci Capi
Department of Mechanical Engineering,
Hosei University, Japan

Genci Capi received the B.E. degree from Polytechnic University of Tirana, in 1993 and the Ph.D. degree from Yamagata University, in 2002. He was a Researcher at the Department of Computational Neurobiology, ATR Institute from 2002 to 2004. In 2004, he joined the Department of System Management, Fukuoka Institute of Technology, as an Assistant Professor, and in 2006, he was promoted to Associate Professor. In 2010, he joined as a Professor at the Department of Electrical and Electronic Systems Engineering, University of Toyama, Toyama, Japan. He is currently a Professor at the Department of Mechanical Engineering, Hosei University, Tokyo, Japan. His research interests include intelligent robots, BMI, multi robot systems, humanoid robots, learning and evolution.

Keynote Title: "Machine learning for socially assistive intelligent robots operating in human environments"

Abstract

The research on intelligent robots will produce robots that are able to operate in everyday life environments, to adapt their policy as environment changes, and to cooperate with other team members and humans. Operating in human environments, the robots must process in real-time a large number of sensory data such as vision, laser, microphone, in order to determine the best action. Learning and evolution have been proved to give good results generating a good mapping of various sensory data to robot action. In this talk, I will overview the existing efforts including our attempts at creating intelligent robots operating in everyday life environments. I will focus on remotely operating surveillance robot, robot navigation in urban environments, and assistive humanoid robot. I will show experimental results that demonstrate the effectiveness of proposed algorithms.

Programme Agenda

Day 1: 2ⁿᵈ December 2020

09.00 AM – 12.00 PM	Workshop 1:	Powering up React by Mouly Gunarathne Tech Lead - DevOps & Software Engineering, Mobitel (Pvt) Ltd.
12.00 PM – 01.00 PM	Lunch Break	
01.00 PM – 04.00 PM	Workshop 2:	Deep learning Face Recognition by Roy Ian, Data Scientist, ADA Asia (Pvt) Ltd.

Day 2: 3rd December 2020

09.00 AM – 09.15 AM Joining of Guests

09.15 AM – 09.20 AM National Anthem

09.20 AM – 09.30 AM University Corporate Video Presentation

09.30 AM – 09.45 AM Welcome Address by Director, Information Technology
Research Unit, University of Moratuwa, Sri Lanka

09.45 AM – 10.00 AM Address by Dean, Faculty of Information Technology,
University of Moratuwa, Sri Lanka

10.00 AM – 11.00 AM Keynote Address by Professor Kento Morita,
Graduate School of Engineering, Mie University, Japan

11.00 AM – 11.15 AM Tea Break

11.15 AM – 12.45 PM ICITR Technical Session 1

11.15 AM – 12.15 PM ITRU Research Symposium Technical Session 1

12.45 PM – 01.45 PM Lunch Break

01.45 PM – 02.45 PM ICITR Technical Session 2

01.45 PM – 02.45 PM ITRU Research Symposium Technical Session 2

02.45 PM – 03.45 PM Keynote Address by Dr. Varuna De Silva, Loughborough
University London, United Kingdom

03.45 PM – 05.00 PM ICITR Technical Session 3

Day 3: 4th December 2020

08.30 AM – 10.30 AM	ICITR Technical Session 4
10.30 AM – 10.45 AM	Tea Break
10.45 AM – 11.45 AM	Keynote Address by Professor Genci Capi Department of Mechanical Engineering, Hosei University, Japan
11.45 AM – 01.00 PM	Lunch Break
01.00 PM – 02.30 PM	ICITR Technical Session 5
02.30 PM – 02.45 PM	Tea Break
02.45 PM – 03.30 PM	Panel Discussion on "The Role of Information Technology in Tomorrow's World"
03.30 PM	Presentation of Awards and Vote of Thanks

Detailed Session Plan of ICITR 2020

Thursday, 3rd December 2020
ICITR Technical Session 1

Session Chair	Professor Kento Morita, Mie University, Japan
Session Co-Chair	Dr. Surangika Ranatunga, University of Moratuwa, Sri Lanka
	Dr. Sidath Liyanage, University of Kelaniya, Sri Lanka
Venue/Time	Online/11:15 AM - 12:45 PM

Time	Title & Author (s)
11.15 AM – 11.30 AM	ARIMA and ANN Approach for Forecasting Daily Stock Price Fluctuations of Industries in Colombo Stock Exchange, Sri Lanka *G.W.R.I.Wijesinghe and R.M.K.T. Rathnayaka*
11.30 AM – 11.45 AM	Hybrid Approach and Architecture to Detect Fake News on Twitter in Real-Time Using Neural Networks *Madusha Prasanjith Thilakarathna, Vihanga Ashinsana Wijayasekara, Yasiru Gamage, Kavindi Hanshani Peiris, Chanuka Abeysinghe, Intizar Rafaideen and Prathieshna Vekneswaran*
11.45 AM – 12.00 PM	Machine Learning Approach for Hairstyle Recommendation *Hansini Weerasinghe and Dushyanthi Vidanagama*
12.00 PM – 12.15 PM	Automatic Diagnosis of Diabetic Retinopathy Using Machine Learning: A Review *Piumi Liyana Gunawardhana, Raviru Jayathilake, Yasiru Withanage and Gamage Upeksha Ganegoda*
12.15 PM – 12.30 PM	Prediction of Absenteeism at Work using Data Mining Techniques *Mikhail Skorikov, Muhammad Abrar Hussainy, Mahfujur Rhaman Khan, Mohammad Kaosain Akbarz, Sifat Momen, Nabeel Mohammed and Taniya Nashin*
12.30 PM – 12.45 PM	Sentiment Analysis of Tamil-English Code-Switched Text on Social Media Using Sub-Word Level LSTM *Vidyapiratha Raveendirarasa and C.R.J. Amalraj*

Thursday, 3rd December 2020
ICITR Technical Session 2

Session Chair   Dr. Priyanga Talagala, University of Moratuwa, Sri Lanka

Session Co-Chair   Prof. Chinthaka Permachandra, Shibaura Institute of
Technology, Japan
Dr. Kapila Rathnayake, Sabaragamuwa University of Sri Lanka,
Sri Lanka

Venue/Time   Online/01:45 PM - 02:45 PM

Time	Title & Author (s)
01.45 PM – 02.00 PM	BTDM: A QoS-Based Trust Distribution Mechanism for Cloud Computing *M.F.M. Firdhous and Rahmat Budiarto*
02.00 PM – 02.15 PM	Energy and Power Consumption Analysis of a Wireless Sensor Node Without a Voltage Regulator *T. P. D. Pieris, K. V. D. S. Chathuranga, A. L. Kulasekera, P. Guha and P. Mukhija*
02.15 PM – 02.30 PM	IoT-Enhanced Smart Laser Fence for Reducing Human Elephant Conflicts *M.F.M. Firdhous*
02.30 PM – 02.45 PM	Real-Time Uber Data Analysis of Popular Uber Locations in Kubernetes Environment *T.M Gunawardena and K.P.N Jayasena*

Thursday, 3rd December 2020
ICITR Technical Session 3

Session Chair	Dr. Priyanga Talagala, University of Moratuwa, Sri Lanka
Session Co-Chair	Prof. Chinthaka Permachandra, Shibaura Institute of Technology, Japan
	Dr. Sugeeswari Lekamge, Sabaragamuwa University of Sri Lanka, Sri Lanka
Venue/Time	Online/03:45 PM - 05:00 PM

Time	Title & Author (s)
03.45 PM – 04.00 PM	The Public Sentiment Analysis Within Big Data Distributed System for Stock Market Prediction– A Case Study on Colombo Stock Exchange *M.V.D.H.P. Malawana and R. M. K. T Rathnayaka*
04.00 PM – 04.15 PM	An Elephant Detection System to Prevent Human-Elephant Conflict and Tracking of Elephant Using Deep Learning *K. S. P. Premarathna, R. M. K. T. Rathnayaka and J. Charles*
04.15 PM – 04.30 PM	Multimedia Big Data Platform with a Deep Learning Approach for Flood Emergency Management *I.D.T.T.Weerasinghe and K.P.N.Jayasena*
04.30 PM – 04.45 PM	A Real-Time Density-Based Traffic Signal Control System *W.A.C.J.K. Chandrasekara,* *R.M.K.T. Rathnayakay and L.L.G. Chathuranga*
04.45 PM – 05.00 PM	Identification of Brain Tumor and Extracting its' Features Through Processing of MRI *K.W.D.T. Lakmi, G.P.S.N. Pathirana and T.C. Sandanayake*

Friday, 4th December 2020
ICITR Technical Session 4

Session Chair	Prof. Genci Capi, Hosei University, Japan
Session Co-Chair	Dr. Leelanga Senevirathna, University of Moratuwa, Sri Lanka
	Dr. Pradeep Kalansooriya, General Sir John Kotelawala Defence University, Sri Lanka
Venue/Time	Online/ 08:30 AM - 10:30 AM

Time	Title & Author (s)
08:30 AM - 08:45 AM	Building Social Resilience During Disasters: An Investigation into the Role of Online Social Media Networks *M.F.M. Firdhous*
08:45 AM - 09:00 AM	Design and Evaluation of a Capacitive Sensor for Real-Time Monitoring of Gravimetric Moisture Content in Soil *T. P. D. Pieris and K. V. D. S.Chathuranga*
09:00 AM - 09:15 AM	Human Activity Recognition Using CNN & LSTM *Chamani Shiranthika, Nilantha Premakumara, Huei-Ling Chiu, Hooman Samani, Chathurangi Shyalika and Chan-Yun Yang*
09:15 AM - 09:30 AM	Sinhala Handwritten Character Recognition Using Convolutional Neural Network *Janotheepan Mariyathas, Vasanthapriyan Shanmuganathan and Banujan Kuhaneswaran*
09:30 AM - 09:45 AM	Artificial Neural Network to Estimate the Paddy Yield Prediction Using Remote Sensing, Weather and Non-Weather Variable in Ampara District, Sri Lanka *W. M. R. K Wanninayaka, R. M. K. T Rathnayaka and E. P. N Udayakumara*
09:45 AM - 10:00 AM	Vision-Based Adaptive Traffic Light Controller for Single Intersection *Mahendren Sutharsan, Shehan Rajakaruna, S.Y.Jayaweera, J.A.C.M.Jayaweera and Subramaniam Thayaparan*

Friday, 4th December 2020
ICITR Technical Session 5

Session Chair   Dr. Sanath Jayawardena, University of Moratuwa, Sri Lanka

Session Co-Chair   Dr. Upeksha Ganegoda, University of Moratuwa, Sri Lanka

                       Dr. Thanuja Sandanayaka, University of Moratuwa, Sri Lanka

Venue/Time   Online/ 01:00 PM - 02:30 PM

Time	Title & Author (s)
01:00 PM - 01:15 PM	An Automated Decision-Making Framework for Precipitation-Related Workflows *A. M. Hasitha Adikari, H. M. N. Dilum Bandara, Srikantha Herath and Charith Chitraranjan*
01:15 PM - 01:30 PM	Data Mining Approach for Analyzing Factors Influencing Vegetable Prices *I.M.G.L.Illankoon and B.T.G.S.Kumara*
01:30 PM - 01:45 PM	Evaluation of Re-Identification Risks in Data Anonymization Techniques Based on Population Uniqueness *P.L.M Kelani Bandara, HMN Dilum Bandara and Shantha Fernando*
01:45 PM - 02:00 PM	Prediction of Diabetes Using Cost-Sensitive Learning and Oversampling Techniques on Bangladeshi and Indian Female Patients *Badiuzzaman Pranto,Sk. Maliha Mehnaz, Sifat Momen and Syed Maruful Huq*
02:00 PM - 02:15 PM	Infinity Yoga Tutor: Yoga Posture Detection and Correction System *Fazil Rishan, Binali De Silva, Sasmini Alawathugoda, Shakeel Nijabdeen, Lakmal Rupasinghe and Chethana Liyanapathirana*
02:15 PM - 02:30 PM	IoT Enabled an Open Framework for Air Pollution Monitoring System *B.H. Sudantha, MALSK Manchanayaka, Nilantha Premakumara, Chamani Shiranthika, C. Premachandra and Hiroharu Kawanaka*

Detail Session Plan of
ITRU Research Symposium 2020

Thursday, 3rd December 2020
ITRU Research Symposium Technical Session 1

Session Chair   Dr. Subha Fernando, University of Moratuwa, Sri Lanka

Session Co-Chair   Mrs. Indika Karunaratne, University of Moratuwa, Sri Lanka

Dr. Surangani Bandara, Sabaragamuwa University of Sri Lanka, Sri Lanka

Venue/Time   Online/ 11:15 AM - 12:15 PM

Time	Title & Author (s)
11.15 AM – 11.25 AM	Automatic Labelling & Classification for Research Papers of Wildlife in Sri Lanka *Premisha Premananthan, B.T.G.S. Kumara, Enoka P Kudavidanage and Banujan Kuhaneswaran*
11.25 AM – 11.35 AM	A Review on Mining Software Engineering Data for Software Defect Prediction *J.P.D. Wijesekara and P.G.T.P. Gunawardhana*
11.35 AM – 11.45 AM	An Integrated Solution to Enhance the Flood Disaster Management Process *W.W.M.N.S.B. Wijekoon and Maj R.M.D. Pradeep*
11.45 AM– 11.55 AM	Deep Neural Network and Image Processing Based Approach for Identifying Road Signs *V. Diluxshan and B.T.G.S. Kumara*
11.55 AM– 12.05 PM	Ontology-Based Decision Support System for Subfertility – A Case Study on Female Subfertility *Thenuka, Vasanthapriyan and Banujan*
12.05 PM – 12.15 PM	LSTM and FFNN Based Exchange Rate Prediction Model *Mauran Kanagarathnam, S.Vasanthapriyan, Banujan Kuhaneswaran and S. Prasanth*

Thursday, 3rd December, 2020
ITRU Research Symposium Technical Session 2

Session Chair	Dr. Piumi Ishanka, Sabaragamuwa University of Sri Lanka, Sri Lanka
Session Co-Chair	Dr. Isuru Manawadu, University of Moratuwa, Sri Lanka
	Dr. Chamara Liyanage, University of Sri Jayewardenepura, Sri Lanka
Venue/Time	Online/ 01.45 PM - 02:45 PM

Time	Title & Author (s)
01.45 PM – 01.55 PM	SherLock 1.0: An Extended Version of 'SherLock' Mobile Platform for Fake News Identification on Social Media *M.D.P.P. Goonathilake and P.P.N.V. Kumara*
01.55 PM – 02.05 PM	A Review on Type II Diabetes Prediction Using Machine Learning Techniques *P. D. M. Peiris and H. M. S. C. R. Heenkenda*
02.05 PM– 02.15 PM	IoT Based Learning Enhanced Smart Parking Management System: A Smart City Initiative *L.B.L. Senevirathne and R.P.S. Kathriarachchi*
02.15 PM – 02.25 PM	Personality Prediction Review on Text Modality Dataset *Tharsika Thurairasa*
02.25 PM– 02.35 PM	Retinal Image Analysis to Detect and Classify the Stages of Diabetic Retinopathy *H.A.T. Uthapala and R.M.K.T. Rathnayaka*
02.35 PM – 02.45 PM	Video Data Preprocessing for Soccer Video Highlight Summarization *Asitha Nanayakkara and C.R.J. Amalraj*

Abstracts of the Full-Papers of
ICITR 2020

ARIMA and ANN Approach for Forecasting Daily Stock Price Fluctuations of Industries in Colombo Stock Exchange, Sri Lanka

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Abstract—Time series forecasting is regarded as the most successful criterion among several factors involved in the decisionmaking process to pick a correct prediction model. Improving predictability has become crucial for decision-makers and managers, especially time series forecasts, in various fields of science. Using K-mean clustering and Principle Component Analysis, the dataset is clustered based upon a central point selection and the Euclidian distance measurement. The results define the main contribution sector for CSE, and the business in the selected sector in the 2008-2017 period in accordance with the clustering results. In particular, ARIMA has demonstrated its performance in predicting the next lags in precision and accuracy. With regard to Colombo Stock Exchange (CSE), there are very few studies in the literature that have focused on new approaches to forecasts of high volatility stock price indexes. Different statistical methods and economic data techniques have been widely applied in the last decade in order to classify CSE's stock price, patterns and trade volumes. This article looks at the best sector and organization to invest in and discusses whether and how the deep-learning algorithms for time series data projection, such as the Back Propagation Neural Network, are better than traditional algorithms. The results show that Deep learning algorithms like BPNN outperform traditionally based algorithms like the model ARIMA. For ARIMA and ANN, MAPE values are 0.472206 and 0.1783333 respectively. MAE values are 29.6975 and 4.708423 respectively results for ARIMA and ANN. The MAE and MAPE values relative to ARIMA and BPNN, which suggests BPNN 's superiority to ARIMA.

Keywords—Artificial neural Network, auto regression integrated moving average, Colombo Stock Exchange, Time series forecasting

Hybrid Approach and Architecture to Detect Fake News on Twitter in Real-Time Using Neural Networks

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Abstract—Fake news has been a key issue since the dawn of social media. Currently, we are at a stage where it is merely impossible to differentiate between real and fake news. This directly and indirectly affects people's decision patterns and makes us question the credibility of the news shared via social media platforms. Twitter is one of the leading social networks in the world by active users. There has been an exponential spread of fake news on Twitter in the recent past. In this paper, we will discuss the implementation of a browser extension which will identify fake news on Twitter using deep learning models with a focus on real-world applicability, architectural stability and scalability of such a solution. Experimental results show that the proposed browser extension has an accuracy of 86% accuracy in fake news detection. To the best of our knowledge, our work is the first of its kind to detect fake news on Twitter real-time using a hybrid approach and evaluate using real users.

Keywords—Fake News Detection, Machine Learning, Social Media, Twitter

Machine Learning Approach for Hairstyle Recommendation

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Abstract—According to aesthetic evaluations, hair is the most unique feature which can enhance the facial features of a person. Beauty experts have identified that 70% of overall face appearance completely depends on the haircut or hairstyle. The physical attributes such as the haircut is a major determinant of women's psychology. This is the essence of why a haircut which is matching a woman's face is necessary articulation. But selecting the right haircut or hairstyle is one of the most difficult decisions to take in a woman's life. This paper presents a novel framework to select the most suitable hairstyle or haircut by classifying the face shape. The author considers the shape of the face, beauty experts knowledge related to hair cuts and hairstyles and the length of the hair to develop a model to recommend the most suitable hairstyle or haircut. The author focused to recommend the haircuts and hairstyles for women which is a subsection of this large research area. According to beauty experts identifying the shape of the face is the most important step before selecting the right hairstyle or haircut. The proposed model has the ability to classify the face shape when a user uploaded a portrait of herself. Machine Learning libraries were used to identify the landmarks of the face image and classify the face in the correct shape. Naïve Bayes classification algorithm has used to recommend the most suitable hairstyle or haircut according to the detected face shape., hair length and information collected from the hair experts. User has given an option to share the recommended hair style or haircut with the beautician via "The Beauty Quest" Salon network platform. Five thousand images were trained, and python language has used as the programming language. The accuracy of the face shape classification model is 91% and the accuracy of the hair recommendation is also 83%.

Keywords—computer vison, hairstyle recommendation, machine learning, face shape classification

Automatic Diagnosis of Diabetic Retinopathy Using Machine Learning: A Review

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Abstract—Diabetic Retinopathy is a popular cause of diabetes, causing vision-impacting lesions of the retina. Blindness may be avoided by early detection. The ophthalmologist's manual approach of diagnosing diabetic retinopathy is expensive and time consuming. At the same time, unlike computer assisted diagnostic systems, it may cause misdiagnosis. Deep learning has recently become one of the most effective approaches that has obtained better efficiency in the analysis and classification of medical images. In medical image analysis, convolutional neural networks are more commonly used as a deep learning approach and they are extremely effective. This paper assessed and addressed the new state-of-the-art Diabetic Retinopathy color fundus image classification and detection methodologies using deep learning and machine learning techniques. Additionally, various challenging issues that need further study are also discussed.

Keywords—Diabetic Retinopathy, Deep Neural Network, Convolutional Neural Network, Retinal fundus images, Machine Learning

Prediction of Absenteeism at Work Using Data Mining Techniques

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Abstract—High absenteeism among employees can be detrimental to an organization as it can result in productivity and economic loss. This paper looks into a case of absenteeism in a courier company in Brazil. Machine learning techniques have been employed to understand and predict absenteeism.Understanding this would provide human resource managers an excellent decision aid to create policies that can aim to reduce absenteeism. Data has been preprocessed, and several machine learning classification algorithms (such as zeroR, tree-based J48, naive Bayes, and KNN) have been applied. The paper reports models that can predict absenteeism with an accuracy of over 92%. Furthermore, from an initial of 20 attributes, disciplinary failure turns out to be a very prominent feature in predicting absenteeism.

Keywords—absenteeism, prediction, data mining, classification

Sentiment Analysis of Tamil-English Code-Switched Text on Social Media Using Sub-Word Level LSTM

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Abstract—Social media are the ultimate platforms to express the opinion and to facilitate the creation and sharing of information, ideas, career interests and other forms of expression via virtual communities and networks. Analysing the sentiment features in these ideas in the public posts of social media users will lead to building more accurate behavioural patterns. Importance of these behavioural patterns with respect to the marketing and business perspective has been focused here. When considering the traditional Facebook marketing platform, efficiency and effectiveness of the marketing are very low since the advertisers do not happen to have a proper understanding of the customers that they should address. Thus, to overcome this issue, a system is proposed to identify the behavioural patterns of Facebook users by analysing their social media contents such as posts, comments, interactions, and also reviews and critics on products to enhance the effectiveness of the Facebook marketing. This system mainly focuses on Facebook users in Sri Lanka. Natural language processing is used to process text-based posts (uploaded and shared) and comments of users in order to build a behavioural profile for the users. This system process text data which is composed by using both English and Tamil languages, in code-switching language pattern.

Keywords—Sentiment analysis, Code Switch Text, Mixed language Analysis, NLP, Deep learning, Machine learning, LSTM, Sub-Word-Level.

BTDM: A QoS-Based Trust Distribution Mechanism for Cloud Computing

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Abstract—Cloud computing makes the delivery of computing resources over the Internet as services. As there are many providers in the market, it is necessary to monitor their performance. Several mechanisms for monitoring service quality of providers have been reported in the literature. But, it is not possible to monitor the entire cloud system by a single monitor. Hence, there is a need for a mechanism to share the performance metrics across a large geographical area. In this paper, the authors propose a mechanism called Bayesian Trust Distribution Mechanism (BTDM) for sharing the performance metrics as trust scores across an extended geographical area. The proposed BTDM also checks the reliability of the received scores based on their previous experience and adjusts them based on the reliability of sender. BTDM was tested using simulations and the results show that it performs better than the other mechanisms reported in the literature.

Keywords—Cloud computing, quality of service, trust computing, trust sharing, trust distribution.

Energy and Power Consumption Analysis of a Wireless Sensor Node Without a Voltage Regulator

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Abstract—Wireless sensor nodes are used in a wide range of areas such as environment monitoring, health monitoring, military and engineering applications to transfer sensor data from one location to another location. These sensor nodes usually have sensors, a microprocessor, transceiver, and a limited power supply. Most sensor nodes are configured to be in sleep mode and wakes up periodically and transfers the sensor data. In the sleep mode they consume less energy and most of the power is consumed in the wake-up time. The power consumption directly affects the life span of the sensor node. Sensor nodes typically use linear voltage regulators rather than switching ones to prevent switching noise, switching voltage ripples and to limit the footprint of the switching circuitry. Low dropout regulators are also used as they consume less energy than standard regulators and saves the battery energy. Even the low dropout regulators consume considerable amount of power at the high battery voltages and considerably high current flows through them. If there is way to save this energy, the lifespan of the sensor node can be extended. One way is avoiding the voltage regulator completely. Modern electronic components such as microcontrollers, sensors and transceivers can work in a wide range of voltages and they have internal voltage references. Therefore, the design of a sensor of a sensor node without voltage regulator is possible. In this paper we implemented a sensor node design without a voltage regulator, and we have evaluated and concluded that this design has up-to 40% energy saving compared with same sensor node design with a voltage regulator.

Keywords—wireless sensor node, power saving, power regulation

IoT-Enhanced Smart Laser Fence for Reducing Human Elephant Conflicts

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Abstract— Human animal conflict is a serious problem in several countries in the Asian and African continents. The human animal conflict commonly results in the damage to properties and loss of human/animal life and limbs. The conflict between elephants and humans is considered to be one of the most serious conflicts due to the nature of losses incurred. The most commonly used deterrent used to keep the animals away from human settlements is the electric fence. Though, electric fences could act as a barrier for elephants to enter into villages, with time elephants learn to break them and enter villages. This paper presents the design of a smart laser fence that can be used for detecting elephants as well as chasing them back to the jungle with the help of other associated systems. The tests carried out on the system show that the concept is working and can be deployed in the field after an extensive field test.

Keywords— *human animal conflict, laser fence, smart deterrent system, Internet of Things*

Real-Time Uber Data Analysis of Popular Uber Locations in Kubernetes Environment

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Abstract—Data is crucial in today's business and technology environment. There is a growing demand for Big Data applications to extract and evaluate information, which will provide the necessary knowledge that will help us make important rational decisions. These ideas emerged at the beginning of the 21st century, and every technological giant is now exploiting Big Data technologies. Big Data refers to huge and broad data collections that can be organized or unstructured. Big Data analytics is the method of analyzing massive data sets to highlight trends and patterns. Uber is using real-time Big Data to perfect its processes, from calculating Uber's pricing to finding the optimal positioning of taxis to maximize profits. Real-time data analysis is very challenging for the implementation because we need to process data in real-time, if we use Big Data, it is more complex than before. Implementation of real-time data analysis by Uber to identify their popular pickups would be advantageous in various ways. It will require high-performance platform to run their application. So far no research has been done on real-time analysis for identifying popular Uber locations within Big Data in a distributed environment, particularly on the Kubernetes environment. To address these issues, we have created a machine learning model with a Spark framework to identify the popular Uber locations and use this model to analyze real-time streaming Uber data and deploy this system on Google Dataproc with the different number of worker nodes with enabling Kubernetes and without Kubernetes environment. With the proposed Kubernetes environment and by increasing the worker nodes of Dataproc clusters, the performance can be significantly improved. The future development will consist of visualizing the real-time popular Uber locations on Google map.

Keywords—Uber, Kubernetes, Machine learning, Spark, realtime,Big Data, distributed environment

The Public Sentiment Analysis Within Big Data Distributed System for Stock Market Prediction– A Case Study on Colombo Stock Exchange

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Abstract—Stock price prediction plays an important role on the journey of investors on the stock market. The prices of the company stocks on the market are performed by different deliverables. Social media data sets, news sites, feedback and reviews are some kind of online tools that can affect the stock market. It is often worth using this context to predict the performance of market shares. We take the advantage of Sentiment analysis on Market related announcement and respective public opinions for stock market trend predictions for more accurate recommendations. Sentiment Analysis is a machine learning program for extracting opinions from a text section that is designed to support any product, company, individual or other entity (positive, negatively, neutral). In this research calculations and data processing were performed within machine learning approach with use of Spark model on Google cloud platform. Among most of the stock prediction researches, only few researchers have done their researches on sentiment analysis within big data distributed environment. Logistic Regression and Naïve Bayes perform well in sentiment classification. Main finding of this research is that public opinion significantly influences the fluctuations of market forces and economic factors such as monetarism, government reforms, unforeseen pandemics, interest rates, public trust, and faith in bond market trust. The detection of the feelings pattern will enhance the market prediction as it ensures the consistency of decision.

Keywords—Stock market, Sentiment analysis, Big data, Distributed environment, Machine learning

An Elephant Detection System to Prevent Human-Elephant Conflict and Tracking of Elephant Using Deep Learning

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Abstract—Human settlement is spreading to forest boundary areas because of the population growth, it triggers disputes between elephants and humans, leading to the loss of property and life. Continuous monitoring and tracking of elephants are difficult due to their large size and movement.Therefore, large-scale for real-time detection and alert of elephant intrusion into human settlements, monitoring is needed. Many methods had been implemented for the elephant's intrusion detection and warning systems. Wildlife conservation and the management of human-elephant conflict require a cost-effective method of monitoring elephant behavior. In this paper, a method for the identification of the elephant as an object using image processing is proposed. The major aim of the study is to minimize the human-elephant conflict in the forest border areas and the conservation of elephants from human activities as well as protect human lives from elephant attacks. We used a data set containing elephants and we developed an approach to distinguish elephants and other animals. We used the Convolutional Neural Network and achieved a maximum accuracy of 94 percent. The proposed method outperformed existing approaches and robustly and accurately detected elephants. It thus can form the basis for a future automated early warning system for elephants.

Keywords— Convolutional Neural Networks, Forest border area, Human-Elephant Conflict

Multimedia Big Data Platform With a Deep Learning Approach for Flood Emergency Management

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Abstract—Flood emergency management has been a major issue in the last few decades as it can disrupt human lives as well as the economy and property damage. A flood occurs when the overflow of water that melts relatively dry land. In the hydrology discipline, floods are a field of study and they are the most common and widespread unpredictable weather occurrence of natural sources. Floods can look quite different because anywhere from a few inches of water to several feet is affected by flooding. They can also come on suddenly, or slowly increase. Therefore frequent identification of flood impact levels is very important. This study aims to create a multimedia big data platform with a deep learning approach for flood emergency management. It uses multimedia data as they are freely available as social media data (Twitter and Facebook), satellite image data, crowdsourcing, and sensor network data for mining purposes. As this research based on deep learning and image processing cutting edge technologies, authorities can identify impact level using satellite images and provide a realtime warning for the people or people can use this for selfestimation of flood risk level when they want in their day to day life like detecting passable or low-risk roads in flooding time.The deep neural network plays a major role in feature extraction and data augmentation helps to increase the number of images in the dataset. This study provides a comparative study between VGG16, VGG19, Densetnet169, and MobileNet deep learning models and evaluates the performance by using training and testing data. Dataset compromises of over 1500 data and the conclusions drawn from work prove that the MobileNet model worked with 86% accuracy with high performance. In the latter part of the paper, it will describe future recommendations.

Keywords—Crowdsourcing, multimedia, big data, deep learning, Neural network

A Real-Time Density-Based Traffic Signal Control System

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Abstract— Traffic congestion and accidents have become two major issues in Sri Lanka today. These issues cause to create many social, economic and environmental problems. Lack of effective Traffic Light Control System is one of the reasons for it happen. This research proposed an approach to develop an effective real-time density-based traffic light control system.This research consists of two major parts; Image processing model for capture real-time data and ANN model for predict the results considering real-time data. Identify the best features from gathered data and minimize dimensionality between the features, by principal component analysis (PCA) to train a Neural Network model. Using cameras, lanes are monitored and capture image of its. Detection and counting of number of vehicles in each lane and length of queue is done by using image processing. The data from each lane is sent to the ANN unit. According to the count of vehicles, the trained model will be decided the lane and time limit that will need to allow green phase. The NN model has achieved 0.9274 accuracy in the training phase. Thus, the traffic lights at the intersections will have changed isolated and dynamically according to the conditions of real-time traffic when using this traffic light control system than the existing fixed time traffic light control system or traditional computation algorithms.This system reduces the average waiting time and increases the efficiency of traffic clearance. New adaptive traffic management also reduces the pollution due CO_2 emission and also social and economic problems.

Keywords— Traffic Congestion, Real-Time, Density-Based,Traffic Control System

Identification of Brain Tumor and Extracting its' Features Through Processing of MRI

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Abstract—The abnormal growth of tissues inside the brain is known as brain tumors and they are considered as a life threatening disease. According to the cell types containing in a tumor they can be classified into two groups as Benign and malignant. Benign tumors are considered to be non-cancerous and they have a primitive shape and size. At the same time malignant tumors are considered to be cancerous and do not have clearly defined edges. Modern technology has introduced several types of imaging techniques for internal body evaluation and analysis. Among them Magnetic Resource Imaging techniques are used to analyze many diseases as they have high resolution and better quality compared to others.Using conventional methods to identify brain tumors using MRI and extracting their features are difficult as the brain is complex. Therefor image processing techniques can be used to detect brain tumors and extract features automatically and effectively. This study presents a method to detect and extract features of the brain tumors which consist of five steps:preprocessing, skull stripping, detecting tumors in axial,coronal and sagittal planes, identifying tumor location and extracting features. The outcomes of the research study will help the doctors or the medical technicians to identify the brain tumor and its features in an effective manner.

Keywords—BenignTumors, Magnetic Resonance Imaging (MRI),Feature Extraction., Image Processing

Building Social Resilience During Disasters: An Investigation into the Role of Online Social Media Networks

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Abstract—Within the last ten years, the world witnessed four serious epidemics. COVID-19 has been the most serious of these ones in terms of the number of people affected and the lives lost. In order to contain the spread of the disease many countries including Sri Lanka enforced 24 hour curfews. The social isolation created by lockdowns creates many problems in people including anxiety and depression. Many studies have been carried out on effect of lockdowns on mental well being of people. But, so far nobody has studied whether online social me can help people overcome the negative effects of lockdowns. This research was carried out to fill this gap. An online survey was carried out to understand how people used social media during the continuous curfew enforced by the Sri Lankan government. The research found that the average time spent using social media has increased compared to normal days. Also, majority of the users agreed that the social media helped them overcome the boredom created by the lockdown. This fact was confirmed using statistical tests in this study.

Keywords— *COVID-19, pandemics, social resilience, social media networking.*

Design and Evaluation of a Capacitive Sensor for Real Time Monitoring of Gravimetric Moisture Content in Soil

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Abstract—Soil moisture content measurements are required widely in the fields of lawn maintenance, irrigation systems of farming, soil processing in civil engineering etc. The paper presents a novel two terminal sensor for real-time volumetric soil moisture content measurement. The sensor was designed and tested with two terminals and an epoxy layer. This sensor was designed such that the range of the sensor in the range of the moisture measurement. An a-stable multi vibrator-based circuit was used to measure the capacitance across the two terminals when inserted into soil. A microcontroller-based system was used to measure, calculate the volumetric soil moisture content and save to a SD card. The results validate the effective applicability of the developed sensor in volumetric soil moisture content measurement.

Keywords—Capacitive moisture sensor, soil moisture

Human Activity Recognition Using CNN & LSTM

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Abstract— In identifying objects, understanding the world,analyzing time series and predicting future sequences, the recent developments in Artificial Intelligence (AI) have made human beings more inclined towards novel research goals. There is a growing interest in Recurrent Neural Networks (RNN) by AI researchers today, which includes major applications in the fields of speech recognition, language modeling, video processing and time series analysis. Recognition of Human Behavior or the Human Activity Recognition (HAR) is one of the difficult issues in this wonderful AI field that seeks answers. As an assistive technology combined with innovations such as the Internet of Things (IoT), it can be primarily used for eldercare and childcare. HAR also covers a broad variety of real-life applications, ranging from healthcare to personal fitness, gaming, military applications, security fields, etc. HAR can be achieved with sensors, images, smartphones or videos where the advancement of Human Computer Interaction (HCI) technology has become more popular for capturing behaviors using sensors such as accelerometers and gyroscopes. This paper introduces an approach that uses CNN and Long Short-Term Memory (LSTM) to predict human behaviors on the basis of the WISDM dataset.

Keywords— *Human Activity Recognition, Convolutional Neural Networks (CNN), Long Short-Term Memory (LSTM)*

Sinhala Handwritten Character Recognition Using Convolutional Neural Network

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Abstract—Handwritten character recognition is widely used for the English language. It is difficult to create a character recognition model for south Asian languages because of its shape and compound characters. Among other South Asian languages (e.g.: - Tamil, Hindi, Malayalam, etc.) Sinhala characters are unique, because of their shape, which are having mostly curves and dots. These unique characteristics make it difficult to create a model to recognize Sinhala's handwritten characters. Recognizing handwritten characters rather than typed characters is more complicated because the handwriting of each individual is varying from each other. Therefore the recognition of Sinhala handwritten character need to be improved. Convolutional Neural Network (CNN) is playing a vital role in character recognition by supporting the more efficient image classification. This research focuses on recognizing Sinhala handwritten characters using CNN. Google colaboratory platform is used for the experiment, and python programming language is used for the implementation part. In total, around 110,000 image data were used for the experiment. CNN's performance was evaluated by training and testing the dataset by increasing the number of character classes. When it reaches 100 character class it shows reasonable accuracy of 90.27%. The model was trained by 5 sets of different 100 character classes. Finally, the overall accuracy of 82.33% is achieved for 434 characters. This model outerformed than similar systems.

Keywords—Convolutional Neural Network, Sinhala,Character recognition

Artificial Neural Network to Estimate the Paddy Yield Prediction Using Remote Sensing, Weather and Non Weather Variable in Ampara District, Sri Lanka

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Abstract—In Sri Lanka, seasonal paddy area mapping and rice prediction is based on the traditional methods with poor technologies. Ampara district has been chosen as the study area because its contribution is considered as the second highest paddy yield to the Sri Lankan rice harvest. This study focuses on developing models for precise mapping paddy and predicting the harvest of rice in the Ampara district. It helps the government and persons of authority to take decisions about how to manage the economy based on the rice quantity.Research includes the imageries of satellites sentinel-1 and sentinel-2 the period from April to September 2019. The two classification methods, Divisional Secretory Division (DSD) and maximum likelihood classification were used to identify the real paddy area. The accuracy rates of these classifications were 0.92 and 0.86 respectively. Artificial Neural Network (ANN) model was used to predict paddy rice harvest using sentinel 2 features extracts and round truth data. Mean square error of the model is 0.106 and mean absolute error is 0.245. Increasing the remotesensing imagery directly affects to enhance accuracy. Increasing the number of sample classes and number of classes in various types will raise-up higher accuracy than in here.

Keywords—Sentinel-1A, Sentinel-2A, Time Series, Random Forest, Artificial Neural Network, Rice yield prediction, ReLU

Vision-Based Adaptive Traffic Light Controller for Single Intersection

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Abstract—In this paper, a vision-based adaptive traffic light controller is proposed. The proposed controller was successfully deployed and tested as a complete system in a complex roundabout in Colombo city at a highly congested time. There were two main parts to this implementation. The first part was a vision-based traffic monitoring system. In this part, a system was developed so that it monitored lanes in a junction with cameras and extracted a traffic index based on traffic density,vehicle type, and pixel-wise velocity of vehicles by processing the video streams coming from cameras. The traffic signal light controlling part was the second part of the project. This part dealt with estimating a better timing adjustment for the existing system using a mathematical modeling approach while taking the extracted traffic index as input. This system was operated with the existing system with minimum alterations for easy realworld implementation. The developed prototype was plugged into the existing system to change traffic light phase timing according to the existing traffic level.

Keywords—Adaptive traffic controller, Computer vision,Deep learning, Intelligent transport system, Programmable Logic Controller

An Automated Decision-Making Framework for Precipitation-Related Workflows

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Abstract—Due to weather's chaotic nature, static workflow managers are ineffective in integrating multiple Numerical Weather Models (NWMs) with cascading relationships. Unexpected events like flash floods and breakdown in canal water control systems or reservoirs make decision-making in workflow management further complicated. To enable dynamic decision-making, we need to update part or entire workflow, terminate unfitting NWM executions, and trigger parallel NWM workflows based on recent results from NWMs and observed conditions. Most of the existing weather-related decision support systems cannot trigger or create workflows dynamically.They are also designed for specific geography or functionality,making it challenging to customize for regions with different weather patterns. In this paper, we present an automated decision-making framework for precipitation-related workflows.The proposed framework can manage complex weather-related workflows dynamically in response to varying weather conditions,automatically control and monitor those workflows, and update workflow paths in response to unexpected weather events. Using significant flood-related datasets from the Colombo catchment area, we demonstrate that the proposed framework can achieve 100% accuracy in dynamic workflow generation and path updates compared to manual workflow controlling. Also, we demonstrate that unexpected event identification and pumping station controlling workflow triggers could be improved with advance rule sets.

Keywords—decision support system, workflow management, weather forecasting

Data Mining Approach for Analyzing Factors Influencing Vegetable Prices

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Abstract—Vegetables have a special place in the Sri Lankan economy. The price of vegetables, unlike the prices of other products, changes daily. There are several reasons for this and the examples include environmental conditions, supply variability, demand, festivals and seasonality, social environment, political conditions, etc. The main purpose of this research is to analyze and predict the factors influencing daily vegetable price fluctuations using data mining techniques. In this research, the most influential factors for vegetable prices were classified using the classification algorithms J48, Random Tree, Random Forest, and Support Vector Machine, taking into account the data obtained from the secondary data sources. The highest classification accuracy of 97.7143% was given by the Random Forest algorithm and it also recorded the best values for Precision, Recall, F-measure, and MCC comparing with the other three. Furthermore, it is clear that the Random forest algorithm is the most suitable to predict influential factors and it can be recommended for the purpose.

Keywords—**Vegetable prices, Fluctuation, Classification algorithms**

Evaluation of Re-Identification Risks in Data Anonymization Techniques Based on Population Uniqueness

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Abstract—With the increasing appetite for publicly available personal data for various analytics and decision making, due care must be taken to preserve the privacy of data subjects before any disclosure of data. Though many data anonymization techniques are available, there is no holistic understanding of their risk of re-identification and the conditions under which they could be applied. Therefore, it is imperative to study the risk of re-identification of anonymization techniques across different types of datasets. In this paper, we assess the reidentification risk of four popular anonymization techniques against four different datasets. We use population uniqueness to evaluate the risk of re-identification. As per the analysis, kanonymity shows the lowest re-identification risk for unbiased samples of the population datasets. Moreover, our findings also emphasize that the risk assessment methodology should depend on the chosen dataset. Furthermore, for the datasets with higher linkability, the risk of re-identification measured using the uniqueness is much lower than the real risk of re-identification.

Keywords—Data anonymization, data publishing, privacy, reidentification risk, uniqueness

Prediction of Diabetes Using Cost Sensitive Learning and Oversampling Techniques on Bangladeshi and Indian Female Patients

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Abstract—Diabetes is a major non-communicable disease that is responsible for many associated health risks and is rapidly increasing in low and middle income countries like Bangladesh.Class imbalance existing in datasets is a dire issue that can result the predictions of diabetes to be biased towards the majority class - thus reducing the reliability of machine learning models. Considering the associated risks of diabetes, a decrease in recall can result in life threatening consequences. In order to tackle this problem, a cost-sensitive learning and synthetic minority oversampling technique (SMOTE) have been applied on the PIMA Indian dataset. After that, the models have been tested on PIMA test set as well as on dataset collected from Kurmitola General Hospital (KGH), Dhaka, Bangladesh. Our results demonstrate that this proposed approach has successfully improved the reliability of the previous ML models to predict diabetes among Bangladeshi female population.

Keywords—Diabetes Prediction,Imbalanced dataset, Cost-Sensitive Learning, SMOTE, Precision, Recall

Infinity Yoga Tutor : Yoga Posture Detection and Correction System

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Abstract—Popularity of yoga is increasing daily. The reason for this is the physical, mental and spiritual benefits that could be obtained by practicing yoga. Many are following this trend and practicing yoga without the training of an expert practitioner. However, following yoga in an improper way or without a proper guidance will lead to bad health issues such as strokes, nerve damage etc. So, following proper yoga postures is an important factor to be considered. In this proposed system, the system is able to identify poses performed by the user and also guide the user visually. This process is required to be completed in real-time in order to be more interactive with the user. In this paper, the yoga posture detection was done in a vision-based approach. The Infinity Yoga Tutor application is able to capture user movements using the mobile camera, which is then streamed at a resolution of 1280 x 720 at 30 frames per second to the detection system. The system consists of two main modules, a pose estimation module which uses OpenPose to identify 25 keypoints in the human body, using the BODY_25 dataset, and a pose detection module which consists of a Deep Learning model, that uses time-distributed Convolutional Neural Networks, Long Short Term Memory and SoftMax regression in order to analyze and predict user pose or asana using a sequence of frames. This module was trained to classify 6 different asanas and the selected model which uses OpenPose for pose estimation has an accuracy of 99.91%. Finally, the system notifies the users on their performance visually in the user interface of the Mobile application.

Keywords—Human Activity Recognition, Yoga Posture, OpenPose, Mask RCNN, LSTM, CNN

IoT Enabled an Open Framework for Air Pollution Monitoring System

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Abstract—Blessing with fresh air to breathe is one of the primary living requirements of the Human being. Nowadays, majority of the countries in the world are suffering from the problem of Air pollution. This problem is getting worse day by day because of rapid economic growth, industrialization, urbanization and the resulting rise in energy demand. Air pollution has been become one of the primary concern in Sri Lanka. In most of the Sri Lankan cities, the primary cause for the air pollution is the lack of the prevalence of proper environmental regulations. Although the scientific evaluation of such technologies and systems is generally recognized as a significant facet of open source technologies and their implementation, it is often underexplored in science. This research provides an integrated approach to the development of an Environmental Monitoring System prototype based on open source hardware and software and to track the reliability of the system in terms of data accuracy. This system is able to measure six environmental parameters namely air temperature, air CO Percentage, air NO2 percentage, air O3 percentage, air PM percentage and air SO2 percentage. This research has shown a promising way to create a dense coverage for more cost-effective monitoring of environmental phenomena. Most of the existing monitoring systems for air pollution have inferior accuracy, low sensitivity and require laboratory study. Our implemented system is a three-phase air pollution monitoring system, which have drastically shown improvements over the existing methodologies combining with the Internet of Things (IOT).

Keywords—Air pollution monitoring, IOT, Open-source, Real time data

***Abstracts of the Short- Papers of
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Automatic Labelling & Classification for Research Papers of Wildlife in Sri Lanka

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Abstract—Sri Lanka, is one of the global biodiversity hotspots, which contains a larger variety of fauna and flora. But nowadays Sri Lankan wildlife faced many issues because of poor management and policies to protect wildlife. The lack of technical & research support leads many researchers to retreat to select wildlife as their domain of study. Wildlife research results should be integrated into data-driven decisions on conservation and management, but the existing contribution is not sufficient. This study demonstrates a novel approach to data mining to find hidden keywords and automated labeling for past research work in this area. To model topics and extract the main keywords, we used the Latent Dirichlet Allocation (LDA) algorithms. Using the Topic Modeling performance, an ontology model was also developed to describe the relationships between each keyword. We classified the research papers using the Artificial Neural Network (ANN) using ontology instances to predict the future gaps for wildlife research papers. The automatic classification and labeling will lead many researchers to find their desired research papers accurately and quickly. Our model provides 83% accuracy in this labeling and classification using past research papers on the wildlife of Sri Lanka

Keywords—ANN, LDA, ontology, topic modeling, wildlife

A Review on Mining Software Engineering Data for Software Defect Prediction

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Abstract—Maintaining quality and reliability is a foremost challenge faced by software Developing professionals amid the software development process. A defective module can lead to software failures, changes in development time, and costs as well as leads to customer dissatisfaction. Usually, a Software repository is used in maintaining software for a long period with its upgrades and bug fixing. This paper forwards a literature review that describes software failures along with the consequences. So identifying these defects as earliest as possible is quite important in the software development life cycle. In identifying these defects researchers and Professionals are using different data mining techniques along with defect tracking systems to find out these defects accurately. Since these defect tracking systems and software repositories have a great deal in locating issues in software, it is very much important to improve the defects tracking systems. Defect tracking systems are the places where we can review the history of the software developments in failures as well as in successors. This paper details how to make a conversion between software repositories into active software repositories. Further, this paper details how to use data mining approaches to identify fault-prone modules in the software.This also consists of details on time prediction in defect fixing cases; post or pre-release and various metrics that we can use to predict software defects.

Keywords—Software Defect Prediction, Data Mining Approaches, Software Metrics, Defect Tracking System

An Integrated Solution to Enhance the Flood Disaster Management Process

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Abstract—Floods are the most catastrophic and cataclysmic events of all-natural disasters. According to the world-wide researches, most of the human lives are lost due to these flood disaster situations. Not only the human lives but also it will negatively influence the stability of a country in many. Therefore, every country must have a proper mechanism to effectively manage disaster situations. Flood management process can be categorized into three stages. 1. Flood detection and identification stage. 2. Flood alerting processes and early warning stage. 3. Refugee relocating and rescue processes stage. In order to acquire the fully utilization of this process, these three stages should be properly communicated and co-operated. The main problem of currently available disaster management systems is those are not properly co-operated and linked. Therefore, this research paper suggests a proper integrated software solution for address the abovementioned problem. This system performs flood monitoring, flood detection, early warning sending, refugee relocating and locating processes in an integrated manner with the help of android, cloud, windows application and IOT technologies.

Keywords—Cloud, IOT, Disaster management, android.

Deep Neural Network and Image Processing Based Approach for Identifying Road Signs

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Abstract—Road sign identification in images is an important issue, in particular for vehicle safety applications. Normally it will notify into some stages, those are detection, recognition, tracking and identify with the help of the dataset. Here Convolutional Neural Network [CNN], Robot Operating System [ROS] is using to undertake this project. In this study, as an Objective, To obtain an accurate image representation, this paper would discuss the key methods of separating an image into regions by using data levels. We mainly compare the Counter-based, Region-based, Colour-based, segmentation using edge detection with the boundary estimate. For many image processing and computer vision algorithms, Image segmentation is an important step, while an edge can be informally defined as the edge between adjacent parts of an image. According to the recent year progress of vehicle manufacturing, Bulk of people like to buy this kind of vehicles to use. Because of the safety and stress release of the driving part. Trending map technology navigates to needed places is easier to access. The proposed work aims to detect traffic sign which has illumination variation, Support Vector Machine [SVM]. For the whole system, we need to use the Raspberry pi 3 processor and camera which automatically captures the video data. Research says, that people will get safe while using the automotive vehicles to have all the facilities to safe the driver/ passenger in the proper way.

Keywords—Autonomous Self-driving vehicle, Road Signal identification, Neural Network image processing, Feature extraction in Image processing, Deep Learning, SVM classifier

Ontology-Based Decision Support System for Subfertility – A Case Study on Female Subfertility

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Abstract—Decision-making in the treatment method of subfertility of a female is a 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 researches. It assists to find the causes and actual treatment method as a recommendation by using the current medical status of the patients. Ontology is selected because it suits to encapsulate the term of concepts and their relationship and specify modeling primitives. Domain knowledge for the subfertility of a female is gained from doctors and medical students. Protégé Ontology Editor 5.5 is used to implement the terms and concepts in the subfertility of a female. Evaluation of developed ontology evaluated by ontology experts, OOPS, DL Query, and SPARQL Query tools. Decision Support System (DSS) is developed using the owl file. The system is validated by doctors and medical students.

Keywords—ontology, female, subfertility, decision support system

LSTM and FFNN based Exchange Rate Prediction Model

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Abstract—The exchange rate is the value of one country's currency concerning another country's currency. Exchange rates are determined by the foreign exchange market. In the economic state, the currency exchange rate of every country tends to vary from time to time. So, it can be said that the exchange rate affects the countries economical system. As we all know, the USD is used by most countries and it is taken as a reference for the exchange rate. So, it is an important indicator for everyone to predict the exchange rate in advance corresponding to their country. During this research, one of the variants of Artificial Neural Network (ANN) has been employed to fulfill the above purpose. ANN can be learned and adapted by the environment quickly which ability makes the ANN could be categorized into various types and each type consists of many models. In this research study, Long Short-Term Memory (LSTM) and the Feed Forward Neural Network (FFNN) have been used to predict the exchange rate of three currencies namely Sri Lankan rupees, Japanese yen, and Chinese yuan concerning the USD. The aforementioned neural network algorithms were compared against each other for finding the best algorithm to develop the final prediction model. There are several performance evaluation methods available among those, accuracy and Mean Absolute Error (MAE) were used to evaluate the prediction performance. Ten years of past exchange data have been incorporated in this regard. LSTM has shown the best performance out of the two algorithms. Finally, the LSTM model has been used for the development of the prediction model.

Keywords—Exchange Rate, Economic System, ANN, LSTM,FFNN

SherLock 1.0: An Extended Version of 'SherLock' Mobile Platform for Fake News Identification on Social Media

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Abstract—SherLock is a CNN, RNN-LSTM based mobile platform to verify and fact-check information on social media.Today, false news is easily created and distributed across many social media platforms. Due to that, people find it difficult to choose between right or wrong information on those platforms.Therefore, a strong need emerges to develop a fact-checking platform to overcome this problem. Fact-checking means the process of verifying information. An extended version of SherLock mobile platform has presented from this study to verify information on social media including many features.CNN, RNN-LSTM based hybrid model ables to capture the high-level features and long-term dependencies from the input text. Some of the features of the mobile application includes factchecking, daily news updates, news reporting and social media trends etc. The mobile platform is developed using Flutter as the front-end framework and Firebase as the back-end framework including REST APIs to gather daily news articles. The hybrid model achieved a 92% accuracy when checking the information circulating on social media.

Keywords—Fake News Detection, Fact-Checking, Deep Learning, Natural Language Processing, Hybrid Approach

A Review on Type II Diabetes Prediction using Machine Learning Techniques

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Abstract—Diabetes is a salient non-commutable disease from which many patients all over the world suffer from regardless of their race, gender and age. Patients with diabetes tend to be affected by many other diseases such as strokes, nerve damage, heart and kidney diseases etc. When considering the mortality rates and life expectancy rates of this disease, it is clear that predicting this disease will contribute to the reduction or even prevention in its early stages. This review paper evaluates various research work that has attempted predicting diabetes mellitus in general and type-2 diabetes using various machine learning techniques such as artificial neural networks, support vector machine, random forest, decision tree etc. The motive of this review paper is to evaluate the selected research work and to suggest the best technique that can be used in clinical facilities to help medical personnel to predict the disease.

Keywords—diabetes mellitus, type-2 diabetes, machine learning, prediction, forecasting, early detection

IoT Based Learning Enhanced Smart Parking Management System: A Smart City Initiative

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Abstract—Smart City is a new concept that emerged from the last decade. It is a revolutionary way of thinking about how the new technological trends and Internet of Things (IoT) can be applied to a city. If a city can monitor and integrate, conditions of all of its critical infrastructures,including roads, bridges, tunnels, rail/subways, airports,seaports, communications, water, power, even major buildings, can better optimize its resources, plan its preventive maintenance activities, and monitor security aspects while maximizing services to its citizens.Parking has always been a predicament in large cities. A person cannot find a parking space inside of the busy urban area with ease, it takes a huge effort to find parking and It creates problems from traffic congestion to other problems like environmental damage to wastage of fuel and time.The study focuses on the parking infrastructure of a city. Parking management systems are already available solutions. The available systems provide the solution to the parking payments and the other management facilities only.The future system will address the problem of finding a suitable parking space that is suitable to the precise user.The new system acts as a single network of parking spaces throughout the city so the user can find a parking space near to the location. To provide a better parking experience to the user, the study adopts machine learning techniques,the system will use user data, feedback, ratings, and behavior to provide a better parking experience. It is a single system to manage every parking infrastructure throughout the city using real-time data transmission and android mobile platform with the use of IoT sensor network and while managing it recommends suitable parking spaces using user feedback, rating, and behavior

Keywords—IoT, Smart City, Android, Smart Parking Management System, Real-Time Database, Sentiment Analysis.

Personality Prediction Review on Text Modality Dataset

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Abstract—Automatic personality detection of an individual's character qualities has numerous significant useful applications. Personality assessment is used to evaluate the individual on different aspects. With regards to assumption examination, for instance, the items and administrations prescribed to an individual ought to be those that have been emphatically assessed by different persons with a comparable personality type.Social media usages have been on an ever-increasing exponential rise. These days sage of social media sites, such as Twitter and Facebook, for social interaction has been becoming a popular trend. Personality trait can be predicted using text modality or visual modality or audio modality or by combining visual and audio then it's called bimodal or combining text, visual and audio then it's called trimodal. Many approaches have been proposed on text modality. This paper gives the reader an overview of the advancement of personality detection used on text modality datasets from text via social media.

Keywords—personality prediction, social media, machine learning, deep learning, big five model

Retinal Image Analysis to Detect and Classify the Stages of Diabetic Retinopathy

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Abstract—Diabetic retinopathy (DR) is an eye disease caused by elevated blood glucose. Most of the working-age people are suffering from diabetics. In certain DR patients, early diagnosis and adequate care may decrease vision loss. The seriousness of the condition should be determined for the delivery of the proper treatment until the signs of DR are identified. The manual process to detect the DR severity stage is needed an experienced clinician & it is taken lots of time. Most of the researchers are compared their prediction accuracy using different classification but this paper predicting the accuracy rate using various image enhancement techniques. This paper introduces a novel method that can detect the DR severity stages without expertise & less time consumption. Using a different type of image enhancement techniques to improve the image quality & using a convolutional neural network to classify the diabetic retinopathy stage accurately in minimum time consumption. In the preprocessing stages, using the CLAHE image contrast technique gamma correction to improve the quality of the image dataset. This paper using CNN used VGG 16 architecture to predict the best results in each type of stage. According to a different type of pre-processing stage novel, image enhancement image is provided a 95.12% accuracy rate rather than others.

Keywords—Image Processing, Machine Learning Techniques, Contrast Limited Adaptive Histogram Equalization

Video Data Preprocessing for Soccer Video Highlight Summarization

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Abstract—This Automatic soccer video summarization is a computer vision-related task that has taken a greater interest in terms of accuracy and speed in computation that would rather replace human labour. A system incorporating computer vision-related techniques for understanding video sequence and extracting high-dimensional data to yield useful information for decision making is a huge challenge with respect to expert systems. The three main modules that the proposed system incorporates are Video shot segmentation module, Keyframe extraction module, and Audiovisual descriptor module. The video shot segmentation module partitions a whole video into separate camera shots. The keyframe extraction module extracts important frames within those shots as processing every frame is time-consuming and not essential. The audiovisual descriptor module consists of tools to analyze and extract a set of low and mid-level audio and video descriptors for every video-shot. The proposed system is designed to output a database that consists of relevant data for every video shot with attached meaning to it. In future, that data can be analyzed to create a soccer video summarization according to relevance interest and the likelihood of the shot by keeping the certain video shots in highlight package or removing it. The application of image processing techniques has paved the way for the proposed system to become realistic.

Keywords—key frame extraction, audiovisual descriptors, Computer vision, and video summarization.

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