



Celebrating 25
years of academic excellence of SUSL

CIS ComSpective

Enlightening perspectives on computing today and tomorrow

The ICT Magazine by the Department of
Computing and Information Systems

- Technologies & Trends
- Research & Applications
- Professional & Personal Development
- Perspectives on Computing
- Software Development Projects
- Interdisciplinary Topics
- Industry Perspectives
- Alumni Views
- News & Achievements



With the aim of exploring today's world-changing sciences and technologies in the domain of computing, the Department of Computing and Information Systems at the Faculty of Applied Sciences, Sabaragamuwa University of Sri Lanka takes a step forward to unite with scholars, industry professionals, logical thinkers, and problem-solvers through *ComSpective* the ICT Technical Magazine.

The Magazine provides a brilliant opportunity for individuals who wish to contribute to the knowledge-base through submitting articles on research investigations, insights, and experiences in the domain of computing.

CALL for ARTICLES

August Issue

We seek original submissions on the following topics of interest:

1. Information Systems
2. Software Engineering
3. Business/IS Alignment
4. Knowledge and Data Engineering
5. Intelligent Systems
6. Multimedia
7. Big Data
8. Computational Biology
9. Human Informatics
10. Affective Computing
11. Devices and Circuits
12. Pervasive Computing
13. Networking
14. Parallel and Distributed Systems
15. Cloud Computing
16. Mobile Computing
17. Services Computing
18. Secure Computing

The Magazine also welcomes articles and contributions on various interdisciplinary collaborations.

Article Categories

- | | |
|-------------------------|---|
| a. Technical Articles | d. Editor's Choice (The Best Student Article) |
| b. Columns | e. Alumni Views |
| c. Features | f. Industry – Current/ Emerging Technologies and Trends, Professional/ Personal Development |
| i. Profile/ Personality | g. Entrepreneurship/ Start-Ups |
| ii. Historical | h. Software Development Projects (Student Articles) |
| iii. News/ Achievements | |
| iv. Photo Feature | |

For author guidelines and further details please visit: <https://www.sab.ac.lk/app/cis-comspective>

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MESSAGE FROM THE VICE CHANCELLOR



Professor Udaya Rathnayaka

*Vice Chancellor
Sabaragamuwa University of Sri Lanka*

It is a matter of immense pleasure for me to write a congratulatory message for the inaugural issue of the *ComSpective*, the ICT Magazine launched by the Department of Computing and Information Systems. I am profoundly pleased to see a bi-annual magazine that encapsulates a wealth of ICT knowledge curated by the academics, researchers, industry experts, students, and the alumni looking to bridge the gap between theory and practice, paving the way for innovations and inventions in the future. I am positive that collective endeavors have culminated in the final product, which is significantly greater and more valuable than the sum of its parts.

In this era of unprecedented acceleration in digital tr-

ansformation, what oxygen is to the existence of all lives, such is the need of ICT to the global knowledge economy. To cope with the unexpected challenges in the education sector caused by the COVID-19 pandemic, digital learning infrastructure is increasingly recognized as supremely important. The Dept. of CIS has been playing a pivotal role in ensuring a continued teaching and learning process amidst this situation while enabling us to transform the crisis into a priceless opportunity for augmenting e-learning and online assessment. Such efforts are crucial in realizing the vision of transforming the SUSL into a Smart University accommodating remote learning for a larger student-base.

The *ComSpective* is instrumental in disseminating knowledge, promoting our unique values and achievements among our major stakeholders, which will be helpful in building up the Faculty's pride as a one that produces world-class graduates and cutting-edge research and SUSL as a foremost benchmark of learning in Sri Lanka. I also believe the untiring efforts of the young and energetic academic staff guided by the senior faculty members and the Head of the Department are truly impressive and all of them deserve the highest kudos. The launch of the *ComSpective* magazine coinciding with the 25th Anniversary of the SUSL marks yet another significant milestone in the history of the University. I wholeheartedly wish for the *ComSpective* to grow from success to success with each succeeding issue.

MESSAGE FROM THE DEAN



Dr. Rasangi Sabaragamuwa

*Dean, Faculty of Applied Sciences
Sabaragamuwa University of Sri Lanka*

Reading a magazine always brings pleasure as each page carries a fascinating and unlike perspective. A magazine in computing will definitely be a compendium of the latest thinking, findings, and innovations in the rapidly evolving world of Information Technology for a wide spectrum of readership.

It is with much pride and pleasure I pen this message for the inaugural issue of the *ComSpective*, a remarkable product by the Department of Computing and Information Systems of the Faculty of Applied Sciences.

The scope of this magazine extends across the world of computing and encapsulates all the vital elements in this fascinating discipline to distill the invaluable knowl-

edge and insights to bring the readership up-to-date and develop their capacity to think, imagine, and innovate. Computing is a highly dynamic arena where there is an incessant stream of innovations which draw the whole world's attention for their sheer potential to change and improve our lives at home, at work, and everywhere else that matter to us.

This publication will deliver its benefits in three major ways. Apart from the foremost focus of knowledge sharing, it will inspire our undergraduates to publish their own creative pieces of writing. I am positive that it will be a noteworthy learning experience and stepping-stone for them to establish themselves as powerful and persuasive communicators. Further, it will help our degree programmes, the Faculty of Applied Sciences, and the University at large to gain higher prominence and attraction.

I thank all the staff of the Dept. of CIS, the editorial board, the review panel, and the writers, for all their tenacious and outstanding work in publishing this magazine successfully. I wish this current issue to be a proud first step of a flourishing sequel.

MESSAGE FROM THE HEAD OF THE DEPARTMENT



Professor S. Vasanthapriyan

Head of the Department
Department of Computing and
Information Systems

In the midst of celebrating the 25th anniversary of the Sabaragamuwa University of Sri Lanka, we have reached an important milestone - the launch of the bi-annual ICT Magazine *ComSpective* as a result of the concerted efforts of the Department of Computing and Information Systems. I am truly honoured to pen this congratulatory message as the Head of the Department.

It is no doubt that we all have to keep pace with the inexorable growth taking place in the world of ICT, say, new trends, breakthrough innovations, emerging technologies and so on. We have formulated a winning strategy to benefit from the proliferation of new knowledge. We effectively disseminate the latest research findings among the undergraduates to deepen their knowledge, sharpen their skills, mould their personalities, and positively influence their worldview within a comprehensive theoretical framework. On top of conducting lectures, we have

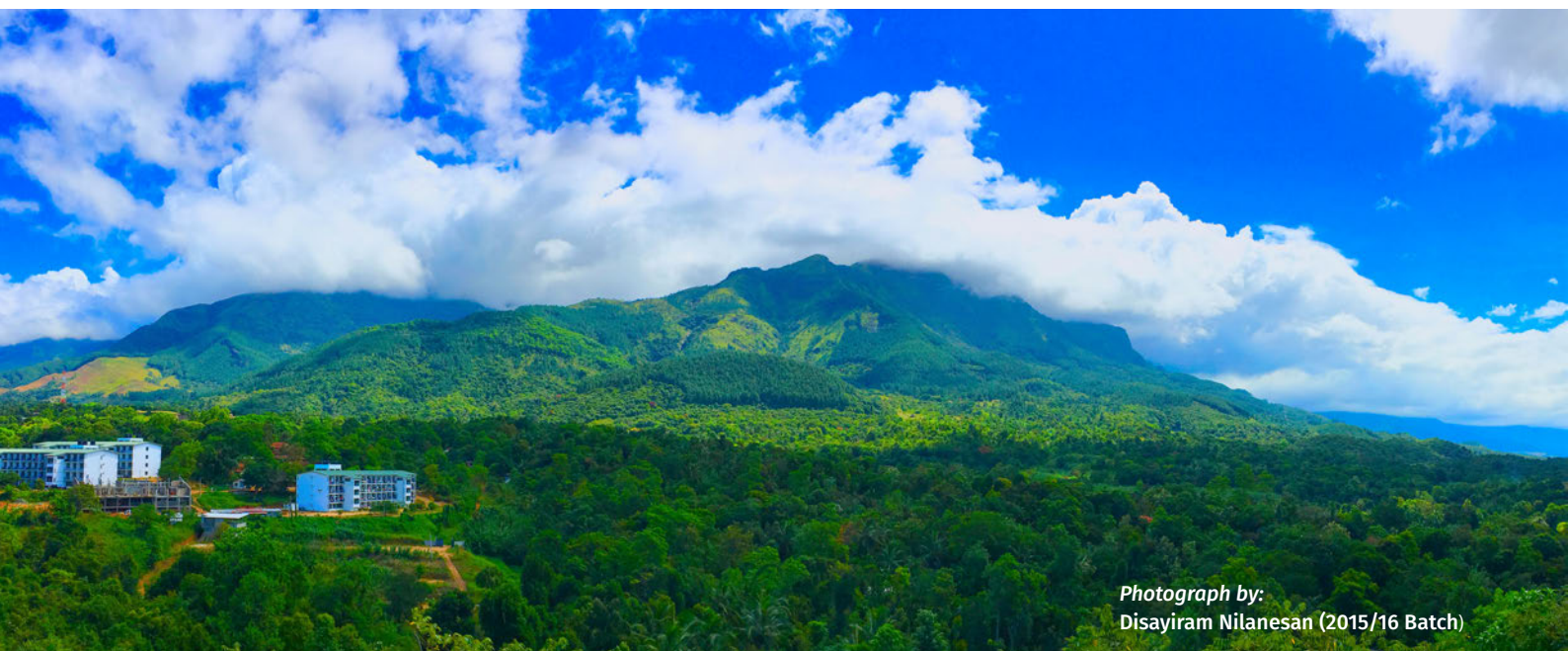
taken a number of initiatives towards this end.

The Department has distinct committees such as “Professional Development”, “Research and Ethics”, “Public Relations”, and “Curriculum, Evaluations, and Procedures” which are respectively entrusted with improving the professional competencies of the staff and the students, committing to nurture a research culture that values excellence, developing strategies to improve and enhance external communications, and improving the quality and relevance of study programmes. I believe the Dept. of CIS sets out on the right path to fulfil its responsibility of producing highly educated and talented graduates with the integrity of character who contribute to the progress of the nation.

I hope you will all find this magazine tremendously valuable for both academic and professional purposes. With the ultimate purpose of gathering and disseminating the latest knowledge emerging around the world, we are always committed to reaching all our interested parties in both academia and industry by introducing the *ComSpective* as a promising first step.

Finally, I'd like to congratulate the entire editorial team for their hard work and dedication that has culminated in the publication of the inaugural issue of the *ComSpective*.

SUSL – EDUCATING MINDS. INSPIRING HEARTS.



Photograph by:
Disayiram Nilanesan (2015/16 Batch)

Nestled amidst a range of misty cloud-capped verdant mountains in the storied region of Belihuloya, SUSL educates, moulds, and inspires students from all over Sri Lanka to harness their fullest potential and excel in their chosen disciplines producing great value for the national economy as well as for themselves.



EDITOR'S NOTE



Dr. Sugeeswari Lekamge

Editor-in-Chief

Senior Lecturer

Department of Computing and Information Systems

We have come a long way, but we have miles to go too

The launch of the *ComSpective* magazine marks a significant milestone for the Department of Computing and Information Systems. It is a momentous achievement for all of us. We have made it happen just as we had envisaged months before. The *ComSpective* is the fruit of our collective intellectual and creative labours.

Today we are living through a tumultuous time as the impact of COVID-19 reverberates through every corner of the globe. Now that vaccinations are being administered, we are optimistic that our lives will return to normal sooner. Also, the dark cloud of COVID-19 has a noteworthy silver line. The outbreak of COVID-19 magnified and crystallised the redemptive power of Information and Communication Technology to keep life going as close to normal as possible despite a universal lockdown. COVID-19 turned the spotlight on remote working, remote learning,

virtual meetings, online shopping, e-Commerce, online payments, and so on bringing to the fore the vital role of ICT education sector in producing competent graduates and also in developing breakthrough research that has the potential to change the world for the better.

At the Department of Computing and Information Systems, we want the *ComSpective* to be a premier technology publication that spans the entire spectrum of ICT and illuminates on its impact on people and organisations. We also want the *ComSpective* to be an outlet for our academics and undergraduates to express their innovative and breakthrough ideas, views, experiments, and research findings. To cut a long story short, we want *ComSpective* to be a masterpiece of an ICT periodical that commands local and international recognition.

Get a Head Start in Your Career as a Fresh Graduate

Mr. Dilum Navanjana points out the cutting edges that make fresh graduates ahead to be selected by the employers in the industry

Hundreds of fresh graduates from different universities join the IT job market annually in Sri Lanka. The competition to get a better IT job is getting harder every year as the bar is being raised continually. Given the global pandemic, it is harder than ever now. Without worrying or getting stressed about the current situation, there are a few things you can do to get yourself ready while you are an undergraduate.

Depending on the career path you are going to choose (Software Engineering, Network Engineering, QA Engineering, Business Analysis, Academic etc.), the options you can choose can be different.

Higher Grades & Good GPA - Early in your career, there is not much in your portfolio that prospective employers can evaluate or measure your skills by. So your university grades and GPA (Grade Point Average) play a vital role in this situation.

University Projects - The projects you carry out as part of academic modules are another great option for you to demonstrate your skills to the prospective. Whether it is a group or individual assignment, as far as it is something you are involved in implementing and something which you can articulate your

contribution to, it will always be valuable in securing your first career. There will be added advantages if the project is hosted online so that your interviewers could take a good look at it and see how it works for themselves.

Self-learned Technologies - Telling your interviewers that your degree programme didn't cover the programming language "X" as an excuse for your ignorance, limited knowledge, or exposure will hardly help. It is most likely to prove disadvantageous. As an undergraduate, it is your responsibility to self-study new technologies by using the theoretical knowledge you get from the university. So, self-learned trending technologies will shine bright on your CV and at your interviews for your first career.

Participate in Competitions - There are various international inter-university competitions in the IT field every year. Achievements from those competitions will prove that you are an outstanding fresh graduate. Also, participating in competitions will help you discover your relative strengths in comparison with your competitors, and will encourage you to work harder.

Online Presence - Nowadays, there are multiple ways for you to demonstrate your skills online rather than merely mentioning them in your CV. Some of them are to write a Tech Blog, achieve a good score in Stack

Overflow, and participate in HackerRank challenges.

Certifications - These days there are various ways you can get a free certification by following a course for a few weeks. Now it has become a very common thing for everyone to have at least a few of those certificates. Even though such certifications tend to receive less and less recognition over time due to their over-prevalence and questionable assessment criteria, they can still prove valuable in sharpening your skills.

Open-Source Contribution - If you can do some real open-source contributions, it will be well recognised by the industry than anything else. It is not something you can do overnight, but with your thirst for fresh knowledge, discipline, self-motivation, and continuous practice, it is quite achievable.

It would be great if you can do all of the above, but to get a head start in your career you do not need all of them. It is better for you to select several options to start working on and build your profile, rather than trying to achieve everything, get overwhelmed after a while, and give up all of them in the middle. The options you choose can be different from those of your friends, because strengths, skills, preferences, and life goals vary from person to person. It is important, therefore, that you strive to recognise and capitalise on your best strengths and skills.



The writer is a Senior Software Engineer at Ascenda Loyalty, Singapore. He is an alumnus of the Department of Computing and Information Systems who graduated in 2016.

Challenges in Local Language Processing

Dr. Sagara Sumathipala clearly expounds the challenges emerged and suggests a way forward in the complex process of natural language processing

Language is the primary human communication technique that behaves like a fluid where new words are introduced and some fall into disuse. Words are the building blocks of a language constructed in a structured and conventional way and conveyed by speech, writing, or gesture. Natural Language Processing gives computers the ability to understand human languages and break the language barrier between the humans and the machine. The way we use language has a significant effect on our identities. However, many languages in the world today are facing language attrition. To what extent your native language may be affected by attrition depends on a number of reasons including the digital revolution. E.g., people worldwide can link with each other and can exchange information instantly through the internet and social media. English is the dominant language used in this exchange of information as most of the World Wide Web contents are in English language.

Sri Lanka is a country with different ethnicities that communicate in several languages. The majority of the Sri Lankans use Sinhala or Tamil as their native language. Most Sri La-

nkans are used to mixing the English language with their native language due to the country being a former English colony and also due to the digital revolution.

Code-mixing which is also known as code-switching is the use of multiple languages in a conversation. E.g., the sentence - “මම study කරනවා”- contains words from both Sinhala and English languages. Another way that code-mixing can take place is when we write sentences in one language using a foreign alphabet. Consider, for example, the sentence - “Mama thaama study karanawa”. Each phenomenon is widely observed in such bilingual or multilingual societies as Sri Lanka. It is often associated with informal or casual conversations as in social media, online chats, or personal communications.

Many of the Asian countries use code-mixed languages to show their linguistic proficiency. Sri Lankans widely use Sinhala-English mixed variant of language known as Singlish and Tamil-English mixed variant known as Tanglish. Code-mixed language is often used because it gives the freedom to use words or phrases from either language, which comes first to one's mind. It reduces the cognitive load on the brain.

Most language processing models in the world today are monolingual, which shows poor performance in multilingual platforms. Past researchers show that the language mostly in code-mixed text, used in social media platforms differs from

the standard language found in more formal text such as books and newspapers. Therefore, it is vital to build new models to process code-mixed text. However, building these models is challenging due to the lack of code mixed text corpus and datasets. Huge amounts of hidden creations are produced by joining lexicon and syntax of multiple languages. Therefore, there are many possible blends of code-mixed languages. Therefore, the construction of datasets for each code-mixed variation seems infeasible.

We can find two types of code-mixing standards, namely, intra-sentential code-mixing and inter-sentential code-mixing. The code-mixing that takes place within a sentence with no superficial change in topic is intra-sentential. The code-mixing that occurs when switching between native and another language to explain an event is inter-sentential. Most social media users e.g., Facebook users tend to use inter-sentential code-mixing over intra-sentential code-mixing and reported that the real lexical needs initiated 45% of the code-mixing, 40% to talk about a particular topic, and 5% to clarify the content. Also, code-mixing depends on various factors such as the level of exposure to the language, the medium of instruction in school or workplace and the frequency of language used in different contexts. All these challenges eventually make it really hard to process and extract knowledge from informal text sources.



The writer is a Senior Lecturer attached to University of Moratuwa. He earned the Doctor of Engineering Degree from Nagaoka University of Technology, Japan. He is an alumnus of SUSL who has obtained the Bachelor's Degree in Computer Science and Technology in 2008.

The Truth about Free and Open Source Software

Mr. Sathira Umesh reveals the truth of open-source software and how to mitigate the potential risks their limitations may entail

Today Free Open-Source Software (FOSS) is heavily used by the organizations engaged in software development. FOSS has, therefore, become an indispensable component in nearly all software applications being developed today. When it comes to FOSS, many companies and developers think they could do anything with the software. But FOSS is rarely a blank cheque. Some FOSS has limitations on what you can do and thus involves a certain degree of risk for any software that you develop using FOSS. Hence, it is important for software companies and developers to read these limitations between the lines. The permissions and the limitations for software are governed by the licenses, unlike some products in the case of which patents are used to safeguard the Intellectual Property Rights.

Based on their limitations, licenses used by FOSS fall under three major categories. They are Permissive Licenses, Semi Permissive Licenses, and Strict Licenses. Permissive licenses grant you the permission to do anything with the software in question such as distributing, modifying, or using the original or the modified source code of

the software in your project, and release your software under your own license. Popular examples for permissive licenses are Apache, MIT, and BSD licenses.

This is not the case when it comes to Semi Permissive Licenses. Semi permissive licenses restrict some of the liberties you can take with it. They are also known as weak copyleft licenses. Copyleft means you are granted permission to distribute and modify the software under the same terms of the original licenses. Weak copyleft means only some restrictions such as you can distribute your software under your licenses as long as you don't use a derivative work e.g., a modified version of the original source code of the FOSS software component; or you could only distribute your software under your license if the FOSS software components are linked, and are only used to run your software and so on. Popular examples or Semi permissive licenses are LGPL, MPL and EPL.

Strict licenses are also known as copyleft licenses that impose restrictions on distributing or modifying original work by requiring that any of the derivative or any software where this software is used should be released under the terms of the original licenses. Most of the strict FOSS licenses require that any work based on the FOSS or use of FOSS should make available the Source Code publicly with or without a fee. What this means is if you use such a

FOSS component in your software you may have to release your software under their licenses, which makes the source code public. A popular example is GPL license. This could be a serious issue for companies that are developing proprietary software. Some companies have to pay a fine if legal actions are taken if a product was released even though they have inadvertently done so.

Hence, license compliance is one of the most important factors that you should take into account in your software development operations. You may wonder if it is even possible to go through all the licenses of the software that you are working on and it would really be a tedious and annoying task. There are special sets of tools known as Software Composition Analysis (SCA) tools that you can use for free or for a fee. You can use one of these tools to detect licenses and create a Bill of Software Components. You can analyse the results and make sure you are compliant with the licenses according to your organisation. One of the most popular FOSS is Fossology and there are many more. Hence, it is clear that FOSS is not completely free and you should evaluate them before using them in your software since it would otherwise entail significant risks once you've already invested time and effort in the project.



The writer is a final year undergraduate of the Department of Computing and Information Systems. He recently started his career as a DevOps Engineer at 99x.

Webinar Series

The Department of Computing and Information Systems had been organizing workshops, seminars, and training sessions for a long time in uplifting knowledge and skills of undergraduates to walk confidently along their preferred career paths. But with the unprecedented circumstances brought by the COVID-19 outbreak, the Department shifted to a new strategy by commencing a series of webinars with the aim of enabling CIS undergraduates to continue their studies at home with the aid of advanced e-Learning technologies. The webinar series comprised of alumni talks, research talks, industry talks, industrial training induction webinars, and Scrum Gym workouts.

ALUMNI TALK SERIES

Alumni Talk Series is a webinar series conducted in collaboration with the alumni of the Dept. of CIS. This has been a perfect opportunity to strengthen the ties between the current undergraduates of the Department and its alumni around the globe who are now highly respected professionals in the field of computing.



Software Code Quality

Mr. Dilum Navanjana

Senior Software Engineer, Ascenda Loyalty, Singapore



Micro Services in 2020

Mr. Randika Hapugoda

Technical Lead, Softcodeit Solutions



Introduction to React

Mr. Lahiru Rathnayake

Senior Software Engineer, Bank of Singapore, Singapore



Design a UI in 10 Simple Steps

Mr. Suresh Wenuka Godakanda

UI/UX Engineer, Pearson Lanka



Test Automation with Selenium Framework

Ms. Oshadhi Nilaweera

Software Quality Assurance Consultant, Virtusa



Microsoft Dev Ecosystem

Mr. Isham Mohomad

Lead Software Developer, KloudyNet Technologies, Malaysia



Introduction to Web Development with Laravel

Mr. Tharindu Lakshitha

Software Engineer, Arimac



AWS Serverless

Mr. Shanaka Nuwan

Full Stack Engineer, Veridate Financial Limited, Hong Kong



Build an App with React-Native

Mr. Omal Perera

Senior Software Engineer, 99X Technology

RESEARCH TALK SERIES

Research Talks webinar series is focused on improving the knowledge and skills needed by the undergraduates in completing their final year research project. In addition, undergraduates with a willingness for a career in academia or research will greatly benefit from this as senior academics and researchers from reputed higher educational/ research institutions conduct sessions on diverse research interests.



AI-Robotics Applications: An Insight of Development, Design and Industry

Dr. Sagara Sumathipala

Senior Lecturer, University of Moratuwa



Machine Learning: The Hidden Art of Computer Science

Mr. Haritha Thilakaratne

Graduate Researcher, La Trobe University, Australia

INDUSTRY TALK SERIES

Industry Talk Series is a webinar series organised with the aim of bridging the gap between the undergraduates' knowledge and skills and the industry requirements with the participation of industry experts from leading software companies in Sri Lanka. Undergraduates have used these sessions not only for getting educated on the latest technologies and trends in the industry but also as a platform for their career development.



Mobile Application Development with Flutter

Mr. Kanishka De Silva
Associate Architect, Creative Software



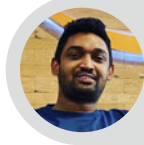
Careers in ERP

Mr. Nilan Niyomal Nathanielsz
Senior Technical Analyst, Hoist Global Tech Solutions



Revolution of Blockchain

Mr. Sharmilan Somasundaram
Senior Software Engineer, 99X Technology



Getting Started with DevOps

Mr. Arshad Zackeriya
Senior DevOps Engineer, Electrify Asia, Singapore

INDUSTRIAL TRAINING INDUCTION WEBINAR SERIES

With the mandatory requirement of undergoing an Industrial Training in their third year, undergraduates of the Dept. of CIS are provided with valuable insights and tips on how to complete a successful internship through the sessions organised under the Industrial Training Induction Webinars. Industry professionals including those from the alumni have been contributing as resource persons for this initiative.



Role of an Intern

Mr. Anura Adikari
University Relations Manager, 99X Technology



Managing Software Projects with Agile & Scrum

Mr. Omal Perera
Senior Software Engineer, 99X Technology



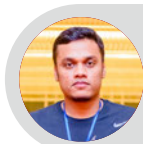
CV Writing

Mr. Damitha Liyanage
Software Engineering Director, Creative Software



Interview Tips

Ms. Dinuka Tharangi Jayaweera
University Relations Manager, Creative Software



How to Jump-Start Your Career with an Internship

Mr. Rasika Nilangarathne
Senior Analyst - HR Systems, Sysco Labs

SCRUM GYM WORKOUTS



Ms. Janani Liyanage
Enterprise Agile Coach, Virtusa

Ms. Janani Liyanage, an Enterprise Agile Coach and Founder of Agility Tune Up Transformation Services, conducted a series of webinars on Agility and Scrum for the final year undergraduates of the Dept. of CIS. Agile and Scrum frameworks are being embraced globally by both IT and non-IT organizations with an intention to increase productivity through high performing teams. Ms. Liyanage has almost 15 years of industry experience as a Senior Software Engineer, a Certified Scrum Master, an Agile Consultant, and an Enterprise Coach. Further, she has been recognized as a Global Goodwill Ambassador for her work in connection with the United Nations' Sustainability Goals in Education Programme.

The workshop was aimed to provide pragmatic insight to Agile and Scrum, so they can become better team players in Agile teams. Further, the workshop covered several activities on how they can plan their life and career using Personal Agility.

Managing an IT Business: Building a Strong Culture of Learning as a Strategic Imperative

Mr. Jayashantha Jayawardhana emphasises on the need for inculcating a strong culture of learning in a forward-looking IT company

The COVID-19 threw the world headlong into the chaos. It forced us to think differently and invent new ways of working, learning, and shopping so as to curb the spread of Coronavirus disease. When, as a result of that, we embraced the concept of working from home, and adopted online meeting and communication platforms such as Cisco Webex, Zoom, Microsoft Teams, and GoToMeeting, etc., and when shopping online became the norm rather than the exception in an unprecedented scale, the world marvelled at the advancements of Information and Communication Technology (ICT).

The ongoing crisis or rather our constructive response to it has served to highlight the importance of ICT as an enabler of business and trade across a great number of industries. In this article, I wish to build the case for cultivating a strong culture of learning as a major strategic imperative for an IT business.

To begin with, for an IT business or for any business for that matter, the most important asset is their people or their 'human capital'. The human capital will pay off only if it consists of talented, motivated, &

committed people, who share strong work ethics and strive for a common goal. To harness their full potential, they should be bound by a set of core values. Setting the vision and the core values of the business and communicating it all persuasively to them go a long way towards a strong culture of learning, which is at the heart of a successful IT business.

Continual learning is pivotal to the growth of an IT business because the field of IT, by its very nature, keeps evolving fast. Whether it is about the emerging technologies, new trends, new security standards, or new coding techniques, IT people must be keen to keep learning. Or else, they risk lagging behind. Also, innovation is impossible in an organisation where learning is not recognised as a strategic priority. A culture of learning, on the other hand, serves to reinforce the habit of learning among the entire workforce whether it is for survival, growth, adaptation, or innovation or for all those purposes.

As in every business, the primary role of the leadership in an IT business too is to set the vision and craft the strategy to fulfil that vision and lead its execution. Here, it is quite important for the leadership to figure out how to create a culture of learning or how to engage and develop talent to achieve their business goals. The leadership must also realise at the same time that learn-

ing is absolutely critical to developing their capacity to innovate in response to the challenges and seizing the lucrative growth opportunities even as they fall a little out of their reach yet. The role of the management is to maintain a proper balance between operations and continual learning in addition to general administration. The management must ensure that operations aren't sacrificed for learning and vice versa.

For a culture of learning to take root and flourish, meritocracy should be hardcoded into the organisation. Staff recruitment, compensation, development, and promotion policy should all be driven by meritocracy as opposed to favouritism. A culture of learning, a collaborative work environment, and meritocracy as a core value they live by, go together and are instrumental to the success of an IT business.

While what I have prescribed here is simple enough and is applicable, by and large, to other businesses as well, I must also admit that it is not that easy to create such an ideal organisational ecosystem. This is achievable only through creating a strong organisational culture as part of its core strategy. Build a strong organisational culture and inspire a cult-like following and the organisation will lead itself changing, evolving, and growing as necessary to the pinnacle of success.



The writer is a Senior Creative Writer at an international e-Business and Digital Marketing Solutions Company and a Regular Contributor to a premier Business Magazine in Sri Lanka. He is a business management graduate from Wayamba University of Sri Lanka.

The Department of CIS in the Eyes of the Alumni

Mr. Joseph Charles

What is most remarkable about the Department of CIS is that it is dynamic and proactive enough to evolve apace the rapidly changing world. The knowledge I could acquire and the values, skills, and positive attitude I was soundly guided to inculcate in my life during the four years of study at the Department of CIS paved my way into the academia.



Having started my career as a demonstrator, today I work as a lecturer at the Department of Physical Sciences and Technology of the Faculty of Applied Sciences. It is with a deep sense of gratitude that I recall the invaluable guidance and mentorship I received from our lecturers. They inspired me to deepen my knowledge in the field of computing.

Over the years, the Department of CIS has launched a number of initiatives to strengthen the collaboration with its alumni and the IT Industry. The Dept. of CIS believes that as instrumental to disseminating the latest knowledge among the under-

graduates to equip them with the practical skills and competencies essential to meet the dynamic requirements of the software industry. The initiatives such as career guidance workshops, technology sessions, and webinars conducted by the industry resource-persons and the alumni have drawn fabulous feedback from the participants.

I am keen to pay my debt of gratitude to my alma mater, the Sabaragamuwa University of Sri Lanka, through continuing my contribution towards its development.

The writer is a Temporary Lecturer attached to the Department of Physical Sciences Technology, SUSL. He graduated with BSc (Hons) Degree in Computing and Information Systems in 2019



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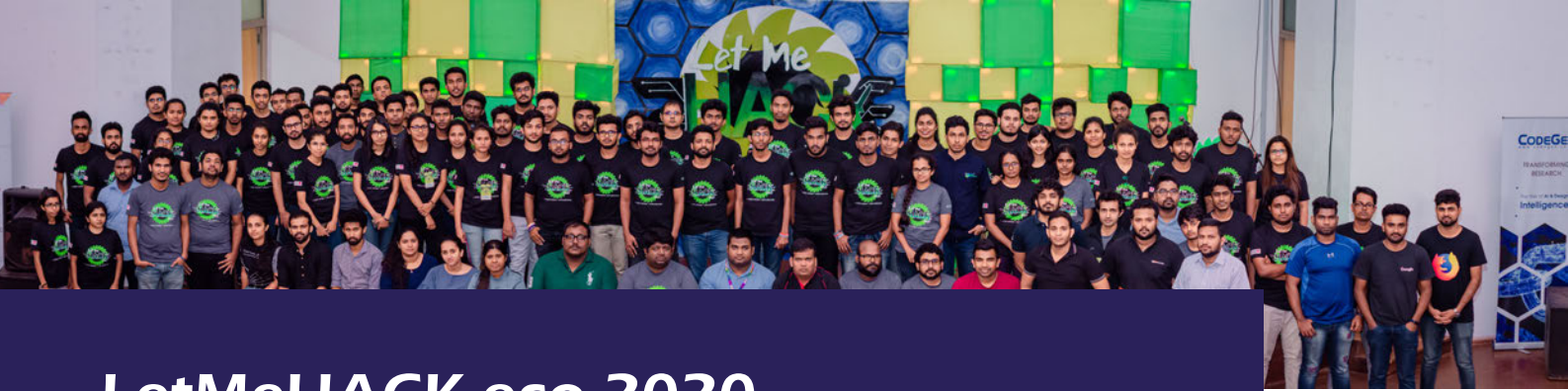
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LetMeHACK eco 2020

ANOTHER UNIQUE SIGN IN HACKATHON CULTURE

Have you ever experienced an event with a green theme that conveys the message to preserve green? Yes, you must have seen and been to many green events, but what is special here is that this is not some type of environmental protection programme, but a hackathon, a congregation of tech folks who will become experts in the IT field one day.



LetMeHACK eco 2020 is the second product-oriented inter-university hackathon organised by the Society of Computer Sciences together with the Department of Computing and Information Systems (CIS) of the Sabaragamuwa University of Sri Lanka. The event was held on 1st and 2nd of February 2020 with the participation of many prominent individuals and teams from 12 state and private universities in Sri Lanka. The event was a great success.



The primary goal of this hackathon was to build a complete software solution to support the waste disposal procedures handled by the Municipal Councils. As the first step, the winning product would be deployed to the Municipal Council of Bandarawela and then, gradually to the other regions of the country as well. Also, with its theme, this event highlighted the value and importance of taking a step to protect and care about our environment.

Even the food packaging materials and all the other product wrappings were all eco-friendly. Also, the stationery and papers were fast decaying or materials embedded with seeds. Instead of PET bottles, everyone used glass bottles which were reusable and harmless to the environment.



This event became a resounding success and apart from the Dept. of CIS and the Society of Computer Sciences, it drew plenty of support from various other parties. Among the many sponsors, this event's Gold Partner was Omobio (Pvt) Ltd, while the Silver and Bronze Partners were CodeGen International (Pvt.) Ltd. and LiveRoom (Pvt.) Ltd., respectively. We gratefully acknowledge their generous support in making the event a real success.

This hackathon was held in a spirit of camaraderie under the guidance and supervision of a panel of judges comprising industry experts, so that the hackers got a very good experience to meet them and receive their invaluable guidance. These mentoring partners came from the top software companies in Sri Lanka including 99X Technologies, Sysco Labs, and Arimac, etc.





The 1st runner up of the event was the team “WiMax” from University of Moratuwa who were awarded with 30,000 LKR, certificates and some presents.

Out of 19 talented teams representing 12 universities, the grand first prize went to the winners of the LetMeHack eco 2020, team “Brogrammers” from the University of Moratuwa.

In LetMeHack eco 2020, just like with its first edition, not only the winners but also all the participants received certificates and souvenirs for their participation. Until its very end, all the participants actively participated in and contributed with unflagged enthusiasm.

The hackathon was a major success not to mention the wonderful memories it left to all of us at the SUSL. It added great value to all the participants and provided them with some invaluable experiences. Therefore, the next edition of LetMeHack is something we eagerly look forward to this year.

Compiled By:
Tharindu Dhananjaya
(2014/2015 Batch)

All the participants were provided with all the essential facilities and plenty of entertainment for them to enjoy during their stay at SUSL, which is definitely a blessed seat of learning.

Finally, the best product developers were selected and the 2nd runner up of the event was the team “</green>” from the Vavuniya Campus of the University of Jaffna and a cash prize of 20,000 LKR were awarded with certificates and some presents.



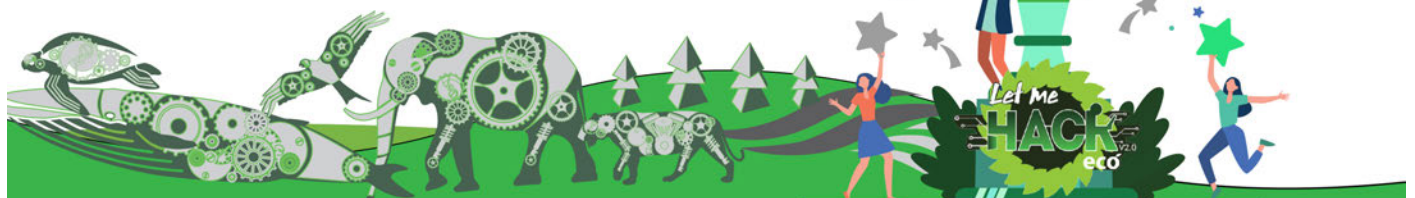
**“Winners don't do different things,
They do things differently”**

LetMeHack eco
<CODE HIKING> EXPLORATION

IEEE Darrel Chong Student
Activity Award-2020
Bronze Category Winner

IEEE Boost
2020
Best Student Activity

IEEE SLSYWC'20
Best Industry Collaborative
Project



Application of Voice Recognition Technology for Automated Bird Field Guides

Tharindu Gallage (The Open University, Sri Lanka)

Gishan Maduranga (Sri Lanka Institute of Information Technology)

Deepchandi Lekamge (Department of Natural Resources, SUSL)

Enoka Kudavidanage, PhD (Department of Natural Resources, SUSL)

Today, 'voice recognition' has become a major technology that is merged seamlessly with many other technologies, that is, from the simplest smartphone AI to the highly advanced biometric security devices. In some cases, the technology behind these could be simple as a 'Simple Word Pattern Matching' or sophisticated as 'Quantum Neural Networks'. The application of this technology or the basic principles with appropriate alterations based on the needs for the benefit of other scientific disciplines such as biodiversity studies might not be an entirely impossible task in the real world.

Although there are bird call recognition apps such as 'Song Sleuth' in the market, audio libraries consisting of bird vocalizations within limited geographical areas are an inherent limitation of many of them. Sri Lanka is home to 482 bird species, of which 7% are endemic to the country¹. The magnificent bird diversity of Sri Lanka is a major driver of nature-based tourism that annually attracts a considerable number of bird watchers from around the world. However, the significant potential for automated bird field guides is yet to be harnessed through the use of advanced technology.

In a voice recognition tool, the uniquely measurable features of bird vocalizations are compared with pre-stored voiceprints in the "library" so as to determine the correlations of voices². The input spectrogram of a bird call can be compared with the same spectrogram that had already been stored in the library as a reference variable. No spectrogram of two species is the same and this could be used to tell them apart from one another. This indeed speeds up the manual process of checking the books and other sources of printed references for bird call recognition.

An Artificial Neural Network (ANN) resembles the decision making process of the human brain. It is built as layers where the features extracted from the bird vocalizations converted to three dimensional Mel Spectrograms (MFC), consisting of time, frequency, and amplitude are fed into the first layer. Then with the processes in each layer, the system finally recognizes the calls as predictions.

However, it is challenging to provide a range of parameters of variables to calibrate the voice changes of the birds of even the same species, due to factors such as having multiple calls, age and mimicking ability. Also, differentiating a call from background noises could be challenging. Further, to ANNs which need to be trained with a huge database, the accuracy of the systems could be challenged by the lack of complete call libraries.

Meanwhile, the most recent studies of deep learning have proven human-level accuracies on many voice recognition applications. The voice recognition model of the birds can be successfully implemented through deep learning as it has the capability to extract deep and significant features. With the help of deep learning models, we can extract significant and specific features that are unique. It is true that in order to train the deep learning model, we have to use a huge amount of data, but many pre-trained Convolutional Neural Network (CNN) models are available to overcome the big data problem.

The Mel Spectrograms can be converted into 3D images and then can be passed through one of the pre-trained models. Then features are automatically learned and finally we can use classification functions like softmax to predict the voice.

The Mel Spectrograms can be converted into 3D images and then can be passed through one of the pre-trained models. Then features are automatically learned and finally we can use classification functions like softmax to predict the voice.

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Mr. Tharindu Gallage is an Environmental Science and Natural Resource Management graduate of SUSL. He is currently working as a Project Assistant at Open University of Sri Lanka and has served as a Demonstrator at the Department of Natural Resources, SUSL.

Responsible AI: The Talk of the Town

Dr. Priyanga D. Talagala suggests the significance of responsible AI for the protection of humanity in an exceedingly unpredictable future

In August 2020, Andrew Ng, co-founder of deeplearning.ai and founding lead of Google Brain, asked an open question; “What is the single most important problem that the Artificial Intelligence (AI) community should be working on?”. Explainable and ethical AI is one of the four key themes emerged from this open survey. Monthly worldwide Google search volumes retrieved from Google Trends for the last decade also verifies this emerging global attention toward the topic. However, explainable AI and ethical AI are only two pillars of Responsible AI and it is important to broaden the conversation to what Responsible AI means in total.

Marvin Minsky, one of its founding fathers of AI, described AI as “the science of making machines do things that would require intelligence if done by men.” Today, AI seems to be everywhere. It has touched almost all aspects of our lives in many ways. However, as noted by Virginia Dignum, Professor of Social and Ethical AI, “AI does not happen to human, it’s an artefact”. According to Deep Learning pioneer, Yoshua Bengio, thinking AI as “magic” is the biggest misconception about AI. It is designed by human w-

ith the aim of fulfilling their goals. Therefore, it is humans’ responsibility to think whether it meets the intended goals; when, where and how it should be applied; and the impact it can have on individuals and the society as a whole.

Over the recent years, AI has become a topic of debates and discussions, where some consider it as a blessing and for some, it is a curse due to many potential risks such as privacy violations, job losses due to automation, socio-economic inequality, algorithmic gender and racial bias issues caused by insufficient or outdated data sources, weapons automation, and Deepfakes. Elon Musk, technology entrepreneur, chief designer of SpaceX, and product architect of Tesla, also believes that AI is more dangerous than nuclear weapons.

As in the Chinese proverb ‘Unless we change direction, we are likely to end up where we are going’. Therefore, the design, development and deployment of future AI systems should focus not just on the technology, but also on the social structures around it. For this, as proposed by Virginia Dignum, autonomy should come with responsibility, interaction should come with accountability, and adaptation should come with transparency. We cannot make a choice among these key aspects of the ART (Accountability, Responsibility and Transparency) design principle and should consider them with

equal level of importance. H2o.ai, an open source leader in AI, explains responsible AI with respect to different, but closely related six core themes: explainable AI, ethical AI, secure AI, human-centered AI, interpretable Machine Learning technology, and compliance.

In summary, *AI for good* is a must but not enough, *AI for all* is also important as AI is integrated into almost everything around us and affects all of us. The development of a product in one part of the world can cause problems in another part of the world. Therefore, Responsible AI should be achieved collectively by the global community. Being fully realized this requirement, some organizations (the European Union, the Organisation for Economic Co-operation and Development (OECD), the IEEE Ethically Aligned Design, the World Economic Forum, etc.) have already taken actions around the social, ethical, and legal aspects of AI. However, ‘Responsible AI’ is still in its infancy and very abstract for most of us. With the rapid advances in AI, the future is unpredictable and can go way beyond our imagination. Therefore, it is humans’ responsibility to use their intelligence and work on the things that seem most important and control the things that are most harmful in achieving an inclusive and socially responsible AI. That is the only way we can shape the kind of future we want. Otherwise, we will be destroyed by an AI monster of our own creation.



The writer is a Senior Lecturer in the Department of Computational Mathematics, University of Moratuwa and an Associate Investigator of the Australian Research Council Centre of Excellence for Mathematical and Statistical Frontiers, Australia. She earned her PhD in Statistics from Monash University, Australia.

Behavior Micro-Segmentation Approach

Yashoda Nandapala (Department of Computing and Information Systems, SUSL)

Pubudu Jayasena, PhD (Department of Computing and Information Systems, SUSL)

The world of technology evolves by the second. Hence, it is critical to adjust the business in response to such technological changes. Because, with technology, consumer requirements are also changing. So, most businesses try to pursue the precise customer relationship management (CRM) process by making new changes in line with the new technologies. For implementing the CRM process more efficiently, most organisations try to determine their loyal and potential consumers exactly. So, they use advanced data analytics and modeling for this purpose.

The behaviour micro-segmentation approach can be identified as one such approach for implementing the CRM process precisely. Behaviour segmentation is segmenting the consumer dataset into the micro-segments according to the behaviour of the consumers. This method is useful for many areas. Researchers find ways that can apply the behaviour segmentation process for further development of the organisations. Most scientists use RFM (Recency, Frequency, Monetary) analysis as a behaviour segmentation approach. RFM analysis is a behaviour segmentation approach and

it is the most popular method for dividing the consumers into small groups based on their behaviours. Results of the RFM are very useful for the strategic decision-makers. RFM can reveal who are the most loyal, prospective, and deviating customers for the organisation.

Micro-segmentation is a much more sophisticated method of categorising customers into several clearly divided micro-segments. Micro-segmentation is one of the most effective mechanisms to segment customer preferences and qualities with an authentic analysis. The market micro-segmentation is just a method of customising all markets to a single section. To improve the importance of their interactions, here the businesses customise their notifications. The organization tailors its notifications that satisfy their consumer tastes and sends offerings for which they are likely to connect. The effect of all these acts is driving loyalty, retention, and profit-building.

Using the RFM method with a micro-segmentation process, companies can easily identify their consumers. This approach mainly involves two steps. The first step is applying demographic segmentation. Demographic segmentation is segmenting the dataset into several demographic segments such as age, gender, income, religion, race, and so on. The second step is applying the RFM method based on the behaviour segmentation for the selected dataset.

Behavior micro-segmentation approach can prove highly effective in many industry spheres such as claim handling in an insurance company, banking sector, vehicle industry, and supermarket industry among others. Using this approach firms can identify which consumers have the highest claim charges or higher frequency value. Through that companies can determine who are their loyal and potential consumers. Through identifying them, companies can make decisions specifically relevant to such consumers e.g., introducing new policies, new products and packages, making changes for claim charges, giving advice, and so on.

Further, this approach can be used with the CRISP-DM (Cross-Industry Standard Process for Data Mining). With this process, data analysts can carry out more precise data mining projects. Using behaviour micro-segmentation with this process, data analytics can provide a reliable and effective solution to manage customer segments for any company in any industry. Following an accurate behaviour micro-segmentation, organisations can increase their profit and growth delivering a higher customer satisfaction in the market.



Ms. Yashoda Nandapala is a final year undergraduate at the Department of Computing and Information Systems. She carries out her research in the field of Data Mining.

Research Awards

GOLD MEDAL



B.I. Batuwanthudawa and K.P.N. Jayasena, "Real-time Location based Augmented Reality Advertising Platform for Smart City", Sahasak Nimavum 2020, *Sri Lanka Inventors Commission (SLIC)*, Sri Lanka.

Category: *University & Tertiary Educational Institutes Category / ICT Category*

BEST PAPERS



K.M.S.U. Bandaranayake, K.P.N. Jayasena and B.T.G.S. Kumara, "A Novel Heuristic Based Workflow Scheduling Algorithm in Cloud Environment," *15th IEEE International Conference on Industrial and Information Systems (ICIIS2020)*, Indian Institute of Technology Ropar, India, 26-28 Nov 2020.

Track: *Computer, Embedded, and Intelligent Systems and Data Engineering*



I.M.G.L. Illankoon and B.T.G.S. Kumara, "Analyzing the Influence of Current Situation in the Country for Vegetable Prices using LDA Topic Modeling," *2nd IEEE International Conference on Advancement in Computing (ICAC2020)*, Sri Lanka Institute of Information Technology, Sri Lanka, 10-11 Dec 2020.

Track: *Data Analytics*



B.I. Batuwanthudawa and K.P.N. Jayasena, "Real-time Location based Augmented Reality Advertising Platform," *2nd IEEE International Conference on Advancement in Computing (ICAC2020)*, Sri Lanka Institute of Information Technology, Sri Lanka, 10-11 Dec 2020.

Track: *Information Systems*

BEST POSTER



K.M.S.U. Bandaranayake, K.P.N. Jayasena and B.T.G.S. Kumara, "A Novel Heuristic Based Scheduling Strategy for Resource Management in Cloud Computing," *10th Annual Research Session (ARS2020)*, Sabaragamuwa University of Sri Lanka, Sri Lanka, 16 Dec 2020.

Session: *Student Poster Session*

SECOND RUNNER-UP



P. Premisha, B.T.G.S. Kumara, E.P. Kudavidanage and K. Banujan, "Ontology-Based Data Mining Approach for Predicting the Research Ideas using Past Research in Wildlife Sector of Sri Lanka," *Women In Engineering Symposium (WIESymp2020)*, IEEE WIE Sri Lanka Section, Sri Lanka, 15 Nov 2020.

The Truth about Blockchain

Mr. Sharmilan Somasundaram emphasizes on the importance of transparency, ownership, and security to make blockchain to be trustworthy in the digital age

Blockchain was introduced to the world in 2009. But the applications/projects started to integrate or run on top of blockchain from 2014 after the release of Ethereum. From that point onwards, there have been many blockchains introduced to the world and many industries and organizations have started using blockchain. A survey conducted by Deloitte among organizations and executives revealed that more than 50% of global organizations view blockchain as a strategic priority and 86% of senior executives believe that blockchain technology will be adopted into the mainstream soon. Also, 77% of executives agree that they will lose their competitive advantage if they don't adopt blockchain¹. These results show the increasing adoption rate of blockchain by different industries and organizations all over the world.

As the title suggests, let's delve into the truth about blockchain, why it is important, and the real reason why it is catching on all around the world. For that, let's view this from a different perspective to understand the truth better. As humans, we witnessed a number of advancements in technology in the past years and lots of things have changed around

us and keep changing as well. We have changed the way we communicate with people, do shopping, watch movies, learn, and even the way we buy food. But if you take a step back and observe the world, you can easily identify things which haven't budged coming as they have been from the Stone Age. One such thing is trust. Humans are so tied up with trust from the early stages of life and we deploy trust in almost everything we do and it is almost the very foundation of our lives. Based on trust, we build relationships, do business, buy products, use applications, do transactions, and so on. Humans have always had a hard time building trust and specially keeping it consistent for so long whether it is with individuals, products, or applications. It is more difficult now than ever before due to the digitisation and virtual lives.

"The most expensive thing in the world is trust. It can take years to earn trust with applications, products, or individuals and just a matter of seconds to lose it"

We need something to reinvent the way we build trust in different aspects of our lives and that is the truth about blockchain. Blockchain is a perfect technology to reinvent the way we build trust with another unknown entity instantly and maintain it consistently. The three important factors humans use in order to build trust are transparency, ownership, and security, which also are the key characteristics of blockchain.

Therefore, businesses and organizations are integrating blockchain to build an instant and consistent trust with another unknown party (customers, partners, or users) to create new business opportunities and allow people to interact with the applications, products, or individuals in a secure and care-free manner with accountability.

As an end note, blockchain reinvents the way we build trust with people and interact with unknown parties. It is not new and it has already introduced this change into many industries where we can trust what we are buying (supply chain) and the transactions we carry out (banking & finance). Also, we can trust and have our data ownership (medical records and applications), instantly trust and verify the digital documents (certificates & contracts) and most importantly we can trust another human being (digital identity and KYC - Know Your Customer) and many more. If you are running or planning to run your own business or start-up, look for ways with which you can improve the trust to get closer to your customers and let them build an instant and consistent trust through blockchain.

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The writer is the Co-Founder & Chief Executive Officer at Niftron and a blockchain consultant/advisor for multiple organizations, businesses, and start-ups.

Become Useful as a UI/UX and Front-end Engineer

Mr. Suresh Godakanda elaborates on harnessing the synergy through group dynamics at play in developing software solutions

UI developer, UX designer and the Frontend developer are few of the most important roles in a modern software development team. These are actual roles than people because other team members also can play these roles.

We all have seen full stack engineers who develop UIs, front-end and the back-end as well. Business analysts may have to do the UX research, sketch mockups and sometimes to design the UIs as well. Front-end developers with UI development skills are not rare anymore.

Ideally, all these roles would be specialized with a specific set of skills and proficiencies which would add an immense value to the development team and to the software product as well. A UX person is expected to study the application domain, understand the requirement and create a specification on the UI and UX. Apart from working alone, driving the whole team in the UX process to design and develop more usable and efficient software applications has a greater importance.

A UI designer can use the outcome of the UX person to plan and design the most usable and efficient UIs which can be implemented at a

low cost. Designing an efficient and technically viable set of UIs without dropping the UX values defined in the UX process is really important.

UI development is all about implementing designed UIs in the most efficient approach in terms of performance and maintainability. A better UI development approach can save a lot of front-end integration and maintenance effort.

In a real world software development team, we might not have the necessity to have separate roles or might not have an affordable budget, even if we want. However, we have to produce the best quality software for our clients. How can we manage the needed skill or proficiency gap then?

The best approach would be to have a proper design and development process and empower the team to play the specific roles at the right time.

First of all we need to adopt a recognized design process and incorporate it into the main software development methodology. A design process is a methodology and a set of tools to produce a better design solution. So, the UX person should have the required skills and the experience to follow the design process as well as drive the team in. UX research, user research, and process optimization are some of the significant techniques that are being practiced in this regard.

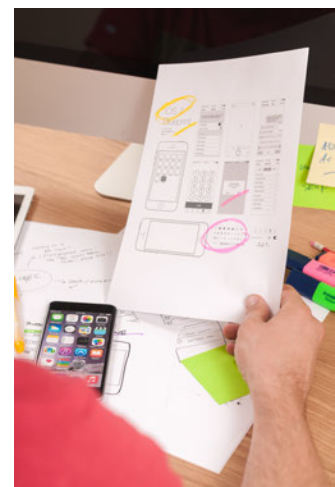
When it comes to UI designing, skills and tools are needed to plan and visualize the UI requirement in a way that can be implemented. Wire-framing, prototyping, and visual designing with UI designing tools are used blended with the aesthetic skills of the person.

UI developers would be thinking of maintaining a good code-base with coding standards and make sure the UIs are performing well to make a better experience for the user. There can be multiple ways to implement something, but the best methods are chosen mostly by the experience and by referring to popular software applications.

At the end of the day all those roles take part in a single team that thrives towards a common goal which is to produce a quality software product. Each role produces a useful outcome for the next set of roles in the process.



The writer is a UI/UX Engineer at Pearson Lanka. He is an alumnus of the Department of Computing and Information Systems who graduated from SUSL in 2015.



Future of Artificial Intelligence and Smart Tourism

Dr. Rangana Shalika contemplates on the potential of AI in boosting smart tourism

Artificial Intelligence (AI) is the idea of expanding the meaning of intelligence as a scientific term that originated during the simplification of logical problem solving in computer science¹. It is the ability to work with intelligent beings in common with a digital machine or a computer-controlled robot. AI is a type of technology that has been developed to mimic actions and activities done by the human mind such as problem solving and learning.

AI and Smart Tourism

AI in the tourism industry is incorporated mainly by learning and understanding the interactions of the customers and improving the future interactions of the customer in relation to the tourism industry. In the modern context, tourists use the internet and smartphones to plan their vacations. The consumers in the tourism industry prefer online based systems that help them find information on their own. Virtual Reality, Chatbots, Robots, AI in Google Maps, Language Translators, Audio Tours, Ease of Shopping, and Facial Recognition are a few of the many types of AI applications widely used in the modern tourism industry to provide the best possible experience to the tourists.



The new smart tourism movement hopes that both tourists and the cities that host them can have a positive impact. Smart tourism also obviously depends on the ability to not only collect huge quantities of data, but also to smartly store, process, merge, analyse, and use big data in business innovation, operations, and services.

A few examples of AI in Tourism and Hospitality Industry

- A welcome robot at the reception at Hilton Hotels uses AI and speech recognition to provide any client who communicates with it, with tourist information.
- AI powered Chatbots have taken over the forefront of customer service on travel agent websites to provide instant feedback and answers to tourists.
- Augmented Reality (AR) is a kind of digital technology which improves peoples' perceptions of their surroundings when observed through devoted devices or smartphones.
- With virtual voice assistants in the rooms, guests can feel more comfortable. For example, they can adjust the temperature in a room, adjust the automatic system of light and switch TV on and off. Also, hotels can speed up the registration process of the guests using facial recognition.
- Lemon Tree Hotel in Delhi installed a facial recognition system to beef up their security. This system captures facial images from the CCTV camera &

compares them with existing images in the database.

Future of AI and Tourism

Though there are some limitations of using AI such as lack of human interaction, affordability, government hindrances etc., AI will be increasingly adopted in the foreseeable future. The convenience, productivity, fast access to services, less human contact, customer privacy, and marketing will be the main reasons to increase the demand for AI. Artificial Intelligence in the near future will have automation solutions for tourists who are facing difficulties in managing their travel plans in the event of a flight delay or cancellation of reservation. With the aid of big data analytics, tourists will be able to go on a vacation without even taking time to plan it as it has already been planned out and managed through AI technology. With the outbreak of pandemics like COVID-19, AI feature systems will be designed which will make in-person interactions nearly redundant, then there will be even higher demand for AI including face-to-face customer service experiences with artificially smart robots.

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The writer is a Senior Lecturer attached to the Department of Tourism Management, Faculty of Management Studies, SUSL. His major areas of expertise include ecotourism, community-based tourism, and sustainable tourism development.

Does e-Commerce Really Add a Value to the Supply Chain?

Ms. Kalindunie Kulathunga explains how e-Commerce makes both local and global supply chains transform into a value-added e-Function

What comes to your mind with the word supply chain? Is it confusing? Have you ever thought, how a supply chain of a manufacturing organization works? However, supply chain will no longer be a confusing and complicated concept because of e-Commerce. Does the e-supply chain ring a bell?

You may be a participant in a supply chain (SC) of a product-driven or service-driven company. But, until today you may not be aware of that. Supply chain of manufacturing organizations could be complicated as it is an integration of upstream, and downstream members of the supply chain.

Why is the supply chain a complex process? Does complexity financially impact on the business? If so, can this be sorted via e-commerce tools? The answer is Yes. e-commerce is the solution. As the supply chain consists of several parties, complexity increases. Therefore, the level of communication and the organizational structure directly impacts on its performance. Poor supply chain performance leads to increases in unplanned cost and inefficiency. Thereby, it will increase the financial pressure on the business.



Can e-commerce really improve the performance of the supply chain?

Yes, e-Business links suppliers, manufacturers, customers, and other supply chain partners via the internet. Thereby eliminates the barrier for communication. So, customers become lucky enough to inform their rapidly changing requirements to the manufacturer. Further, manufacturers are able to market products with a shorter Product Life Cycle (PLC) within shorter delivery lead time.

Is e-Commerce only improving the level of communication?

No, e-supply chain comprises e-procurement, e-logistic, planning and inventory management via wireless devices. Tools such as Electronic Data Interchange (EDI), intranet, extranet, corporate tools and work system tools support SC activities. Especially, companies with e-supply chains are able to mitigate the negative impact of COVID-19 pandemic compared to companies with traditional SC. Because online ordering, online shipment tracking, reminders and alerts on shipment updates and payments, clearing shipments by means of softcopies of invoices and bills of lading were general activities of the e-supply chain, even before the pandemic. Therefore, companies with e-supply chains did not have to specially prepare for pandemic as technological tools and expertise were already in place.

Business process automation is another critical aspect of e-Supply

Chain Management. Enterprise Resource Planning Systems (ERPs), Business Intelligent Systems (BIs), Manufacturing Execution Systems (MESs), Product Data Management Systems (PDMs), and Decision Support Systems (DSSs) enable business process automation. Thereby, reduce the cost and inefficiency of SC activities. Further, collaboration among SC partners is uplifted by cloud computing tools which enable access to each other's systems via the internet. Social media networks also play a vital role in understanding and catering the customer requirements.

It is considered that one year of e-Supply Chain is equal to four years of a traditional SC. But, conversion of traditional SC to an e-Supply Chain is not a transformative process that could be performed within an overnight. More importantly, e-commerce tools should be compatible with current business processes and current hardware and network infrastructure. If not the company has to consider business process reengineering as well as upgrading current technological tools. In addition, trustworthiness among participants of the e-Supply Chain is critical. Because, there could be security loopholes when collaborating with each other's systems. If a traditional business is financially stable and if its top management is more optimistic about technological advancement, e-Supply Chain is not a dream to them anymore.

The writer is an Assistant Manager (Procurement) at Dipped Products PLC. She is a CIMA passed finalist and holds an MBA. She is an alumnus of the Department of Computing and Information Systems.



Academic Staff Research Publications

Journals

01. **B.T.G.S. Kumara**, I. Paik and Y. Yaguchi, "Context-Aware Web Service Clustering and Visualization," *International Journal of Web Services Research*, vol. 17, no. 4, pp. 32 - 54, 2020, doi: 10.4018/ijwsr.2014040102.
02. **K. Banujan, B.T.G.S. Kumara** and I. Paik, "Strengthening Post-Disaster Management Activities by Rating Social Media Corpus," *International Journal of Systems and Service-Oriented Engineering*, vol.10, no.1, pp.34-50, 2020, doi: 10.4018/IJS-SOE.2020010103.
03. M. A. Elaziz, L. Li, **K. P. N. Jayasena** and S. Xiong, "Multiobjective Big Data Optimization based on a Hybrid Salp Swarm Algorithm and Differential Evolution," *Applied Mathematical Modelling*, vol. 80, pp. 929-943, 2020.
04. M.A. Takalkar, **S. Thuseethan**, S. Rajasegarar, Z. Chaczko, M. Xu and J. Yearwood, "LGAttNet: Automatic Micro-expression Detection using Dual-stream Local and Global Attentions," *Knowledge-based Systems*, p.106566, 2021.
05. S. Janarthan, **S. Thuseethan**, S. Rajasegarar, Q. Lyu, Y. Zheng and J. Yearwood, "Deep Metric Learning based Citrus Disease Classification with Sparse Data," *IEEE Access*, Vol 8, pp.162588-162600, 2020.
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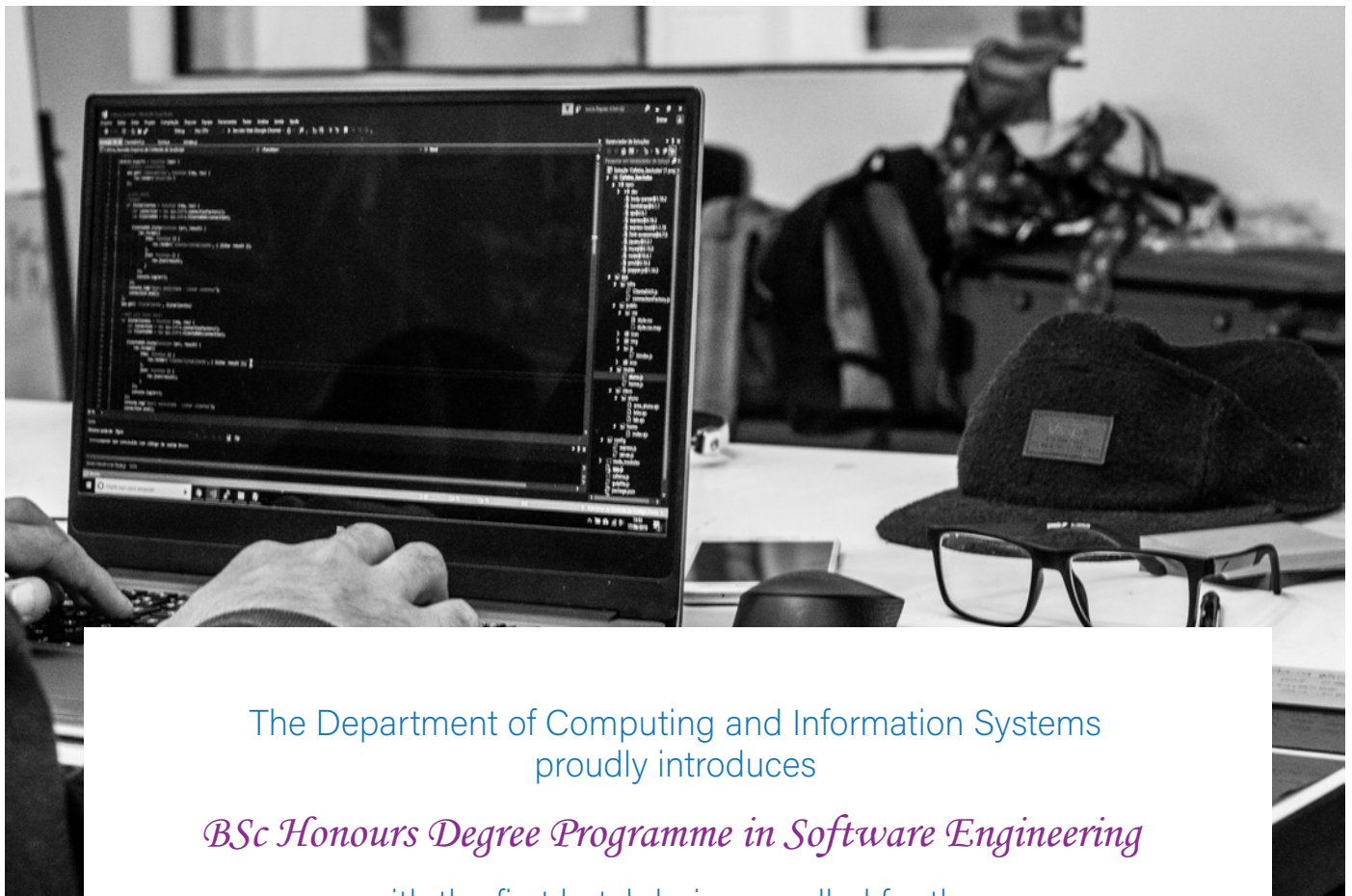
Book Chapters

01. J. Charles and **L. S. Lekamge**, "An Ensemble Learning Approach for Automatic Emotion Classification of Sri Lankan Folk Music," *Lecture Notes in Networks and Systems*, Chapter 23: Springer, 2021 (Accepted).
02. **K. P. N. Jayasena** and G. S. W. de Chickera, "Load Prediction Energy Efficient VM Consolidation Policy in Multimedia Cloud," *Advances in Computer Communication and Computational Sciences*, pp. 893-903: Springer, 2021
03. **S. Vasanthapriyan** and **K. Banujan**, "Knowledge Transfer between Senior and Novice Software Testers: A Qualitative Analysis in Sri Lankan Software Companies," *Software Engineering for Agile Application Development*, P. Chung-Yeung, ed., pp. 266-281, Hershey, PA, USA: IGI Global, 2020.

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01. **H. N. Gunasinghe**, J. McKelvie, A. Koay, M. Mayo, "Comparison of Pretrained Feature Extractors for Glaucoma Detection," *IEEE International Symposium on Biomedical Imaging (ISBI2021)*, 2021, France.
02. J. Charles and **L. S. Lekamge**, "Machine Learning Approaches for Emotion Classification of Music: A Systematic Literature Review," *IEEE International Conference on Advancements in Computing (ICAC2020)*, 2020.
03. J. Charles and **L. S. Lekamge**, "Machine Learning for Emotion Classification of Sri Lankan Folk Music," *14th IEEE Conference on Industrial and Information Systems (ICIIS2020)*, 2020, doi:10.1109/ICIIS47346.2019.9063313.

04. **K. Banujan** and **S. Vasanthapriyan**, "Bridge Ontology Architecture for Knowledge Management in Bridge Maintenance," *Moratuwa Engineering Research Conference (MERCon2020)*, Moratuwa, Sri Lanka, 2020, pp. 1-6.
05. **S. Thuseethan**, S. Janarthan, S. Sutharshan, P. Kumari and J. Yearwood, "Multimodal Deep Learning Framework for Sentiment Analysis from Text-Image Web Data," *IEEE/WIC/ACM International Joint Conference on Web Intelligence and Intelligent Agent Technology (WI-IAT2020)*, 2020, Melbourne.
06. **S. Vasanthapriyan** and **K. Banujan**, "Modeling HiBrinto Ontology to Develop Knowledge Management Portal for Highway Bridge Construction," *32nd International Conference on Software Engineering and Knowledge Engineering (SEKE2020)*, KSIR Virtual Conference Center, USA, 2020, pp. 71-76.
07. Y. T. Premathilaka, **K. Banujan** and **B. T. G. S. Kumara**, "Ontology-based Approach to Determine the Coverage of Examination Papers," *International Conference on Decision Aid Sciences and Application (DASA2020)*, Sakheer, Bahrain, 2020, pp. 613-617.



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The Computational Linguistics of Biology: Decoding the Language of Life

Sivanujan Suthaharan (Department of Chemistry, Faculty of Science, University of Jaffna)

Salomi Arasaratnam (Department of Zoology, Faculty of Science, University of Jaffna)

Gajapathy Kanapathy (Department of Zoology, Faculty of Science, University of Jaffna)

Since the origin of the earth, roughly around 4.5 billion years ago, till the current moment in 2021, the earth and the beings have witnessed many scintillating revolutions. Humans are at the centre of most of these changes. The knowledge economy that is being built up exemplifies its esteemed power. How would this have been possible? Which factor influences the most in expressing one's knowledge? The 'Use of Language' or technical prowess.

Computational biology is an interdisciplinary realm where large collections of biological data are computationally stored, interpreted, and analysed. In this context, it is not a simple personal computer where we store information anymore, but a super machine with huge computational power to think and analyse.

The computational linguistics, according to the Association for Computational Linguistics (ACL), is the scientific study of language in computational perspectives. Communication among human species goes easy where the language used is often referred to as Natural Language (NL). NL Processing (NLP)

is the best tool being implemented in recent years which dramatically reduces the communication gap between humans and computers. So, when the language of life is identified and processed like a Natural Language, computers chill-out with the biology, of course now with some social distancing!

For instance, consider the structure of the Severe Acute Respiratory Syndrome Coronavirus - 2 (SARS-CoV-2) spike glycoprotein depicted in Figure 1¹. Obtaining this three dimensional (3-D) orientation using conventional lab techniques and tools is not straightforward. But, with the computational reality where a unique language with 'text or a pool of letters' describing this protein is available which can be easily understood, decoded, and arranged as a 3-D model.



Figure 1 SARS-CoV-2 spike glycoprotein (EMD-21452)

If we consider the biological sequence of the spike glycoprotein, it can be seen that the structure of the protein extensively relies on Protein Sequence Language (PSL). Akin letters and words in a text, the protein

sequence is a linear chain of amino acids (i.e. the fundamental building blocks of the proteins, illustrated with distinct letters). The degree of analogy of this Sequence-Structure with that to the human Natural Language is analysed by many and as Ganapathiraju et al. (2005) shows, this analogy is based on the fact that the biological sequences also correspond to raw texts².

Understanding the structure, function and dynamics of the protein structure is essentially analogous to the process of aligning the words to get the meaning in natural language.

The FASTA (a text format for the biological sequence) where the entire text is made up of unique letters encoding the protein is understood by their order of arrangement. This implies the analogy between natural language processing with that of the computational processing of biological language.

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Mr. Sivanujan Suthaharan is a recent graduate with BSc (Hons) Degree in Chemistry from University of Jaffna. His research interests include computational material science, computational biology, and energetics.

Social Media & Small and Medium Scale Enterprises

Ms. Amitha Wickramaarachchi assesses the potential of digital media platforms to make SMEs invincible in their respective markets

The advancement and expansion of digital technologies, has levelled the playing field both locally and internationally for all businesses regardless of their scale or scope. All types of businesses have an equal opportunity to play in the market and bring themselves to the doorstep of customers. Conventional SMEs were waiting for customers to visit their outlets and buy their products in person. In the new era, discovery commerce has emerged and let the customers discover the available products and spark off the interest in customers to buy rather than force them via conventional advertisements.

SME sector in Sri Lanka plays a vital role in the economy as the growth engine by providing 45% of total job opportunities and 52% of contribution to the Gross Domestic Product (GDP) while representing 75% of enterprises out of the total of Sri Lanka (Ministry of Industry and Commerce, 2015). Though SMEs accounted for a considerable portion of the total number, their effort for marketing was not up to the satisfactory level in the past. However, with the emergence of digital technologies, there have been ample marketing opportunities for SMEs.

Direct marketing via social media is one of the greatest developments which is a convenient and cost-effective method for SMEs since a majority of people use social media platforms. Sri Lanka's digital literacy rate is 46% (Department of Census and Statistics Sri Lanka, 2019). There is an increasing trend in digital literacy in Sri Lanka whilst the same trend is observed in the internet usage. This has created ample room for entrepreneurs to expand their business operations internationally.

SMEs have received greater opportunities to promote their business to a larger customer base via social media including Facebook, Instagram, WhatsApp, and YouTube. One common issue confronting the SMEs in Sri Lanka is the financial constraints that stand in the way of business continuity and expansion. Hence, they are unable to spend much on marketing and promotion. Social media platforms have created wonderful openings for SMEs to reach their target markets exponentially at lower cost. Though some businesses use these advancements of digital technology, that is not the optimum level that they could reach. Although there are plenty of options to be used for their business promotion and marketing, they do not use them effectively as yet. Facebook has provided many freely available tools which can be used by bus-

inesses to promote their businesses digitally. Facebook Business Manager tool is one such option, which helps to advertise products and services connecting clients around the globe. But, most SME entrepreneurs in Sri Lanka are not yet aware and familiar with those digital marketing tools to propagate their businesses. Thus, SMEs can get a lot of gains out of social media due to cost-effective outreach to the international market on a real time basis.

COVID-19 pandemic has shaken the entire business world to search for different paths making corporate firms incline more towards digital transitions than ever before. Therefore, most conventional businesses are moving on a new path with online business platforms and especially, SMEs are getting lots of benefits out of this. Accordingly, there's a massive vista of opportunity for them to penetrate new markets and strengthen their competitive advantage over the rivals.



The writer is a Lecturer attached to the Department of Business Management, Faculty of Management Studies, SUSL. She earned her Master of Business Administration Degree from Faculty of Graduate Studies, SUSL.

Society of Computer Sciences (SOCS)

As one of the major initiatives envisaged by the Department of Computing and Information Systems with the purpose of building the aptitude of the undergraduate students in the field of computing, the Society of Computer Sciences (SOCS) was founded in 2012. The SOCS will ultimately encourage students to improve themselves and become professionals in the IT industry as it is driven by the following objectives.

- To improve the knowledge and skills in Computer Science and Technologies
- To fulfil human and technical requirements of IT in the university
- To organise IT related events in the University

Even if SOCS was formed with the students of the Dept. of CIS, its membership has been open for undergraduates and academics from other departments and even from other faculties of SUSL who take an active

interest in the field of computing.

Since 2012, SOCS has been instrumental in organising a number of programmes including career guidance sessions and workshops, hackathons and career fairs. Further, it has been hosting numerous technology programmes namely, 'Fortnight Meetup', 'Virtual Rival', 'Entrepreneurship Caravan', 'Robotics Meetup', and 'CodeNight'. The inter-university hackathon, 'LetMeHACK' organised by the SOCS together with the Dept. of CIS is yet another notable event which opened up many opportunities for the IT students in the country to collaborate with the industry experts and showcase their talents. The SOCS will carry on its purposeful endeavours to enhance the skills and competencies of its membership long into the future.

Compiled By:
Kumudu Kaushalya (2014/15 Batch)

IEEE Student Branch of SUSL

The IEEE Student Branch of SUSL was established in 2016. From its humble start, it has evolved over the past few years into a remarkable society of undergraduates who take pride in its membership and actively and consistently participate in and contribute to its proceedings.

IEEE inspires a global community through highly cited publications, conferences, technology standards, and professional and educational activities by helping members to cultivate their professional networks.

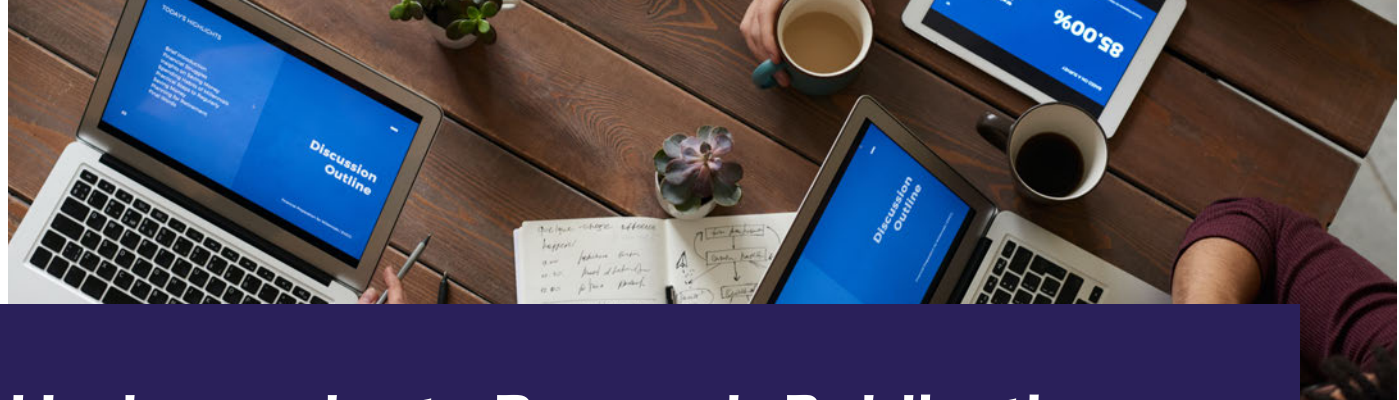
The IEEE Student Branch of SUSL has made numerous achievements. As the inaugural event, the branch hosted IEEEExtreme successfully just one year after its establishment. It also earned the honour of hosting IEEE Sri Lanka Section Student/ Young Professional/ Women in Engineering Congress 2017. One of the greatest breakthroughs was "LetMeHACK V2.0", the first-ever eco-friendly product-oriented inter-university hackathon in Sri Lanka, which led the IEEE Student Branch of SUSL to win the Bronze Award at Darrel Chong Student Activity Awards 2020, the

Best Student Branch Activity Award in IEEE Boost 2020, and the award for the Best Industry Collaborative Project in IEEE SLSYWC'20.

While organising events such as Ayubowan IEEE, supporting FortNight Meetup, Code Night, CIS Tech Talk, and contributing to knowledge building, IEEE also hosts many entertaining events such as the annual intra-university gaming competition and Virtual Rival.

With the establishment of IEEE IAS (Industry Applications Society), the Branch is keen to establish the other IEEE chapters including WIE (Women in Engineering). The IEEE Student Branch of SUSL will continue to be one of the leading IEEE student branches in the country and provide the platform for showcasing the innovative and creative ideas of the undergraduates.

Compiled By:
Isuru Ranapana (2015/16 Batch)



Undergraduate Research Publications

The list includes the research publications of the undergraduates of 2014/15 batch of the Department of Computing and Information Systems.

Journal Articles

01. **M. M. Gunarathna**, R. M. K. T. Rathnayaka and W. M. W. Kandegama, "Identification of an Efficient Deep Learning Architecture for Tomato Disease Classification Using Leaf Images," *Journal of Food and Agriculture*, vol. 13, no. 1, pp. 33-53, 2020.
02. **I. D. T. T. Weerasinghe** and K. P. N. Jayasena, "CNN based Deep Learning Models for Flood Impact Level Identification," *International Journal of Innovative Science and Research Technology* (Accepted).
03. **S. P. C. W. Sandagiri**, B. T. G. S. Kumara and K. Banujan, "Deep Neural Network based Crime Prediction using Twitter Data," *International Journal of Systems and Service-Oriented Engineering* (Accepted).

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01. **B. I. Batuwanthudawa** and K. P. N. Jayasena, "Real-time Location based Augmented Reality Advertising Platform," *2nd IEEE International Conference on Advancement in Computing (ICAC2020)*, 2020.
02. **E. Y. L. Nandapala** and K. P. N. Jayasena, "The Practical Approach in Customers Segmentation by using the K-Means Algorithm" *15th IEEE International Conference on Industrial and Information Systems (ICIIS2020)*, 2020.
03. **E. Y. L. Nandapala**, K. P. N. Jayasena and R. M. K. T. Rathnayake, "Behavior Segmentation based Micro-Segmentation Approach for Health Insurance Industry," *2nd IEEE International Conference on Advancement in Computing (ICAC2020)*, 2020.
04. **G. W. R. I. Wijesinghe** and R. M. K. T. Rathnayaka, "ARIMA and ANN Approach for Forecasting Daily Stock Price Fluctuations of Industries in Colombo Stock Exchange, Sri Lanka," *5th International Conference on Information Technology Research (ICITR2020)*, Moratuwa, Sri Lanka, 2020.
05. **G. W. R. I. Wijesinghe** and R. M. K. T. Rathnayaka, "Stock Market Price Forecasting using ARIMA vs ANN; A Case Study from CSE," *2nd IEEE International conference on Advancement in Computing (ICAC2020)*, 2020.
06. **H. P. T. M. Jayawardana** and R. L. Dangalla, "Hybrid Encryption Protocol for RFID Data Security," *The 2020 International Conference on Decision Aid Sciences and Applications (DASA'20)*.
07. **I. D. T. T. Weerasinghe** and K. P. N. Jayasena, "Multimedia Big Data Platform with a Deep Learning Approach for Flood Emergency Management," *5th International Conference on Information Technology Research (ICITR2020)*, Moratuwa, Sri Lanka, 2020.
08. **I. M. G. L. Illankoon** and B. T. G. S. Kumara, "Analyzing the Influence of Current Situation in the Country for Vegetable Prices using LDA Topic Modeling," *2nd IEEE International conference on Advancement in Computing (ICAC2020)*, 2020.
09. **I. M. G. L. Illankoon** and B. T. G. S. Kumara, "Data Mining Approach for Analyzing Factors Influencing Vegetable Prices," *5th International Conference on Information Technology Research (ICITR2020)*, Moratuwa, Sri Lanka, 2020.

10. **K.M.S.U. Bandaranayake**, K.P.N. Jayasena and B. T. G. S. Kumara, "An Efficient Task Scheduling Algorithm using Total Resource Execution Time Aware Algorithm in Cloud Computing," *IEEE International Conference on Smart Cloud (Smart-Cloud)*, 2020.
11. **K.M.S.U. Bandaranayake**, K.P.N. Jayasena and B. T. G. S. Kumara, "A Novel Heuristic based Workflow Scheduling Algorithm in Cloud Environment," *15th IEEE International Conference on Industrial and Information Systems (ICIIS2020)*, 2020.
12. K.P.N. Jayasena, **K.M.S.U. Bandaranayake** and B. T. G. S. Kumara, "TRETA - A Novel Heuristic based Efficient Task Scheduling Algorithm in Cloud Environment," *IEEE Region 10 Conference (Tencon)*, 2020.
13. **K. S. P. Premarathna**, R. M. K. T. Rathnayaka and J. Charles, "An Elephant Detection System to Prevent Human Elephant Conflict and Tracking of Elephant using Deep Learning," *5th International Conference on Information Technology Research (ICITR2020)*, Moratuwa, Sri Lanka, 2020.
14. **M. M. Gunarathna** and R. M. K. T. Rathnayaka, "Experimental Determination of CNN Hyperparameters for Tomato Disease Detection using Leaf Images," *2nd IEEE International Conference on Advancement in Computing (ICAC2020)*, 2020.
15. **M. V. D. H. P. Malawana** and R. M. K. T. Rathnayaka, "The Public Sentiment Analysis within Big Data Distributed System for Stock Market Prediction - A Case Study on Colombo Stock Exchange," *5th International Conference on Information Technology Research (ICITR2020)*, Moratuwa, Sri Lanka, 2020.
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21. **S. P. C. W. Sandagiri**, B. T. G. S. Kumara and K. Banujan, "Detecting Crimes Related Twitter Posts using SVM based Two Stages Filtering," *15th IEEE International Conference on Industrial and Information Systems (ICIIS2020)*, 2020.
22. **T. M. Gunawardena** and K. P. N. Jayasena, "Real-Time Uber Data Analysis of Popular Uber Locations in Kubernetes Environment," *5th International Conference on Information Technology Research (ICITR2020)*, Moratuwa, Sri Lanka, 2020.
23. **W. A. C. J. K. Chandrasekara**, R. M. K. T. Rathnayaka and L. L. G. Chathuranga, "A Real-Time Density-based Traffic Signal Control System," *5th International Conference on Information Technology Research (ICITR2020)*, Moratuwa, Sri Lanka, 2020.
24. **W. M. D. R. Ruwantha** and B. T. G. S. Kumara, "LSTM Based Approach for Classifying Twitter Posts for Movie Success Prediction," *International Conference on Decision Aid Sciences and Applications (DASA'20)* 2020.
25. **W. M. R. K. Wanninayaka**, R. M. K. T. Rathnayaka and E. P. N. Udayakumara, "Artificial Neural Network to Estimate the Paddy field Prediction using Remote Sensing, Weather and non-weather Variables in Ampara District, Sri Lanka," *5th International Conference on Information Technology Research (ICITR2020)*, Moratuwa, Sri Lanka, 2020.
26. **Y. Thenuka**, S. Vasanthapriyan and K. Banujan, "Evaluation and Validation using Delphi Method and Field Test for Subfertility Decision Support System," *SLAAS/SLIC from Innovation to Impact (FITI2020)* 2020.
27. **M. A. A. Thaajwer** and U. A. P. Ishanka, "Melanoma Skin Cancer Detection Using Image Processing and Machine Learning Techniques," *2nd IEEE International Conference on Advancement in Computing (ICAC 2020)*, 2020.



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Industry Research & Development

KEYNOTE SPEAKERS



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Department of Computer Science and Information Systems, Texas A&M University, Commerce, USA
Chair of IEEE Smart Computing Special Technical Community



Associate Professor Chinthaka Premachandra

Department of Electronic Engineering
Shibaura Institute of Technology
Japan

PLENARY SPEAKERS



Prof. Prasad M. Jayaweera
University of Sri Jayewardenepura



Dr. Sagara Sumathipala
University of Moratuwa



Dr. Windhya Rankothge
Sri Lanka Institute of Information Technology



Mrs. Dilrukshi Gamage
University of Moratuwa

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