ISSN 2773-725X

ComSpective

Enlightening perspectives on computing today and tomorrow

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

Faculty of Computing
Sabaragamuwa University of Sri Lanka

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Volume: 03 Issue: 01 April, 2023

With the aim of exploring today's world-changing sciences and technologies in the domain of computing, the Faculty of Computing, Sabaragamuwa University of Sri Lanka takes a step forward to unite with industry professionals and researchers 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 technology insights, research investigations and experiences in the domain of computing.

ComSpective

Enlightening perspectives on computing today and tomorrow

Call for Articles
Volume 03 Issue 02

Important Dates

Submission: 31st July 2023
Publication: 30th September 2023

We seek original submissions on the following topics of interest:

1. *Information Systems*
2. *Software Engineering*
3. *Pattern Analysis and Machine Intelligence*
4. *Security and Privacy*
5. *Signal Processing*
6. *Networking and Telecommunications*
7. *Human Informatics*
8. *Internet Computing*
9. *Pervasive Computing*
10. *Affective Computing*
11. *Knowledge and Data Engineering*
12. *Industrial Informatics*
13. *Robotics and Automation*
14. *Image processing and Computer Vision*
15. *Services Computing*
16. *Multimedia Technologies*
17. *Cloud Computing*
18. *Visualization and Computer Graphics*

The magazine also welcomes articles and contributions on various emerging and interdisciplinary topics

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Faculty of Computing, Sabaragamuwa University of Sri Lanka | SOCS Society Of Computer Sciences, Sabaragamuwa University of Sri Lanka | IEEE Student Branch, Sabaragamuwa University of Sri Lanka

Published by
Faculty of Computing
Sabaragamuwa University of Sri Lanka
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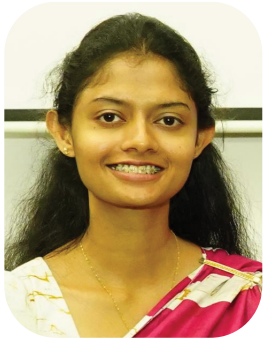
EDITOR'S NOTE



Dear Reader,

Sri Lanka is one of the most beautiful countries in the world which consistently ranked first in the region for educational, literacy, and other factors that other developing countries in the region envy. However, the current escalation of the economic crisis and the increasing inflation rates have created a slew of threats for all Sri Lankans. Even despite the fact that many proposals have been made to address the current economic crisis, professionals are working hard to develop fresh inventive ideas to study the core reasons and find solid answers. As a responsible Sri Lankan citizen, it is everyone's responsibility to support and assist fellow citizens in any way feasible.

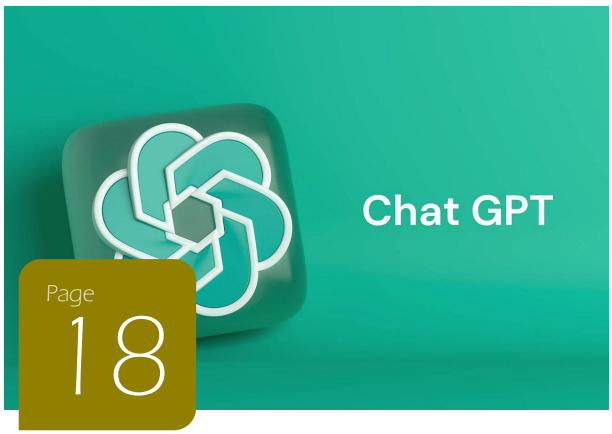
Sri Lanka's Information Technology (IT) market is best recognized for outsourcing both knowledge and processes, IT services, and software development. Sri Lanka's IT industry may support over 200,000 employment and is expected to generate more than USD 5 billion by 2023. As a result, Sri Lanka is one of the world's most likable outsourcing destinations. Although the IT service sector has demonstrated consistent development in the past, tech start-ups have gained prominence in the last two years. While economists seek to discover the best possible answer to the present challenge, as IT professionals, our readers are encouraged to contribute to economic growth.

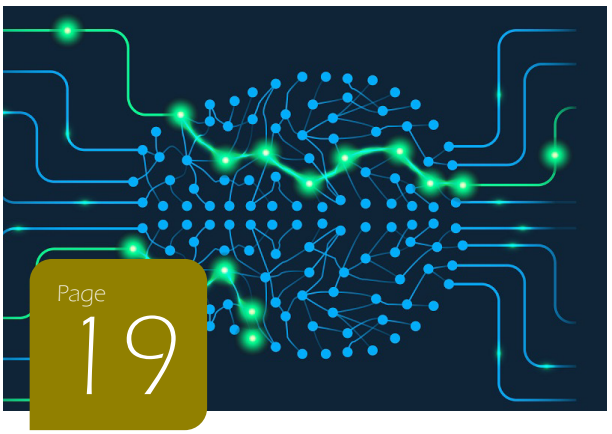
With the aim of encouraging the respected authors and readers to innovate sustainable IT solutions for the current economic crisis, The Faculty of Computing is pleased to announce a new issue of the ComSpective magazine, which has a collection of technological articles written by well-known technology professionals from across the country. We are proudly celebrating its third successful year with the help of respected readers as a significant contribution to a better future.

Thank you.

Subodhi Wasalathilaka
Editor-in-Chief

FEATURES





CONTENT

The Faculty of Computing is pleased to present the First Issue of the Third Volume of ComSpective, the bi-annual ICT magazine.

We dedicate ourselves to making the world smarter, with each and every Issue of the Magazine, spanning a broad range of computing disciplines.

Faculty of Computing
Sabaragamuwa University of Sri Lanka

Story behind the Success

The Sabaragamuwa University of Sri Lanka (SUSL) celebrated another important milestone at the beginning of 2023, by establishing its new faculty. Thus, by an Order made by the Minister of Education Dr. A.D. Susil Premajayantha, under Section 27(1), published in the Gazette Extraordinary 2312/14 on December 27, 2022, the Faculty of Computing (FoC) has been established as the 9th Faculty of SUSL. Senior Professor R.M.U.S.K. Rathnayaka, the Vice Chancellor of the Sabaragamuwa University of Sri Lanka, Mr. Saman Uyangoda, the Registrar, the academic and administrative staff, as well as students and well-wishers, graciously attended the house-warming ceremony of the Faculty of Computing on January 2, 2023.



The Vice Chancellor of Sabaragamuwa University of Sri Lanka, Senior Professor R.M.U.S.K. Rathnayaka, highlighted the necessity for the establishment of the Faculty of Computing at SUSL in the University Action Plan 2021, "Way Forward to a Smart University." The outcomes of surveys conducted by national IT industry steering committees, such as the "National IT - BPM Workforce Survey 2019," corroborated these assumptions concerning higher education institutions' success in developing a competent workforce. As a result, beginning in July 2021, the academic staff of the Faculty of Applied Sciences' Department of Computing and Information Systems at the Faculty of Applied Sciences under the leadership of the former Head of the Department of Computing and Information Systems Professor S. Vasanthapriyan, initiated to prepare the proposal for the establishment of the Faculty of Computing. A comprehensive need analysis survey was carried out employing different stakeholder groups including university academics, researchers, industry representatives, alumni, representatives of government agencies, and IT industry governing bodies. The survey was conducted in light of three major considerations: contribution to meeting industrial needs, contribution to achieving national goals, and contribution to regional development. The findings of the survey stressed the need for expanding opportunities for computing education and revealed the potential of SUSL in establishing the FoC and thereby contributing to cater the national goal of achieving a stable demand-supply in the ICT industry.




The curricula of all Degree Programmes offered by the FoC are thoughtfully designed to align with the curriculum standards set by the Association for Computing Machinery (ACM)/Institute of Electrical and Electronics Engineers-Computer Society (IEEE-CS)/ and the Association for Information Systems (AIS). The FoC invites pros-

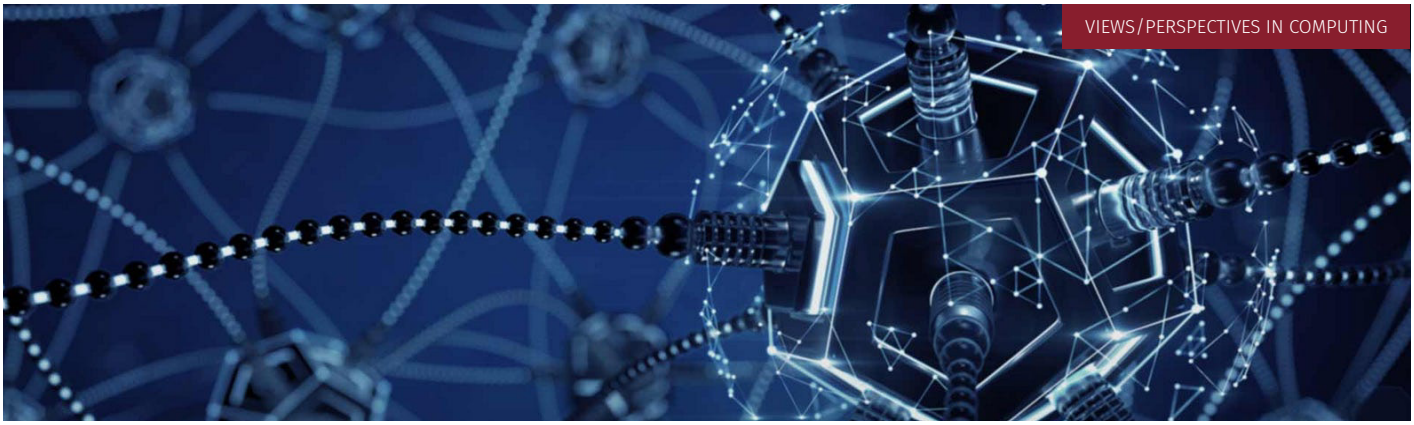
pective students from a larger range of disciplines beginning at the G.C.E. Advanced Level in an effort to increase access to higher education and meet the steadily increasing demand for computing graduates. Each Degree Programme fosters Outcome Based Education (OBE) and Student Centered Learning (SCL) and the final year research, industrial training, and capstone project/ mini project are considered as compulsory components in the Degree completion. Adding to its already impressive achievements, in November 2022, the BSc Honours Degree Programme in Computing and Information Systems received Grade "A," - the maximum level of accomplishment and quality expected of a degree programme in the Programme Review conducted by the Quality Assurance Council of the University Grants Commission (QAC-UGC). As a Faculty, we are working harder and more passionately towards improving the effectiveness of the processes for managing and ensuring the quality of all its Degree Programmes.

The many efforts that were started as a Department under numerous committees focusing on research and ethics, curriculum design and development, professional development, and public relations are now going deeper and broader with the establishment as a Faculty. The FoC hosted the International Conference on Advanced Research in Computing - ICARC 2023 for the third consecutive time, on 23rd and 24th February 2023 as a hybrid event with the participation of local and international attendees. The Sabaragamuwa University Journal of Computer Science (SUJS), another initiative fostering research and knowledge dissemination, which is published by the Faculty as a peer-reviewed journal with the aim of providing researchers, innovators, and scholars a platform to share their research findings that contribute a high-quality, readable, and valuable addition to the knowledge. Additionally, collaborating with undergraduates, academics, and industry professionals, through ComSpective, the bi-annual ICT technical magazine, the Faculty offers a fantastic chance for individuals who want to add to the knowledge base by writing articles on their research, discoveries, and for sharing computing-related experiences.

Undergraduates in the Faculty of Computing are continually winning awards for their research, innovation, aesthetics, and sports. They have an insatiable need to expand their knowledge, improve their skills, and shape their personality. We are encouraged to proceed with the cooperation of the entire student body of the Faculty, including the members of the IEEE Student Branch of SUSL, the Women in Engineering (WIE) Affinity Group of SUSL, and the Society of Computer Sciences (SOCS).

As a Faculty which maintains a good rapport with the industry, the FoC signed a Memorandum of Understanding (MoU) with the Sri Lanka Association for Software Service Companies (SLASSCOM) on February 01, 2023. This remarks its inaugural activity as a Faculty.The MoU sets out the goals and objectives of the SLASSCOM and the FoC in developing and promoting the University-Industry collaborations, enabling FoC to realize its vision to conduct undergraduate and postgraduate Degree Programmes committing to produce talented employable graduates of a world class standard having both technical and core professional skills. Being the fourth Computing Faculty in the country and the first and foremost institution for Computing education in the Sabaragamuwa province, the newly established Faculty is looking forward to contributing towards the regional development by implementing technical solutions within local authorities and collaborating with them to enhance digital literacy through organizing training programmes, workshops, and knowledge-sharing sessions.

The Faculty of Computing is confident in its future growth, ensuring access to human resources and a physical infrastructure capable of providing high-quality computer education at SUSL. This would be made achievable by our combined efforts and dedication, which would be increased by the participation and support of all of our stakeholders.



ARTIFICIAL NEURAL NETWORKS

Ms. Tyni Egoda Gedarage *(iit18038@std.uwu.ac.lk) and* ***Mr. W.A Sanjeewa*** *(aruna.s@uwu.ac.lk)*

The writer is an undergraduate of the Department of Computer Science and Informatics, Faculty of Applied Sciences at Uva Wellassa University. Her research interests are Artificial Intelligence and Machine Learning.

The writer is a Lecturer at the Department of Computer Science and Informatics, Uva Wellassa University of Sri Lanka.

What do you feel when you are hearing the topic of Artificial Neural Networks ANNs? It is deep and complex as you think but it is a beautiful concept when you dive deep into this topic. A system of hardware and/or software that is based on the neurons in the human brain function is known as an artificial neural network (ANN). As a result, they are an excellent tool for modeling non-linear statistical data. In-depth learning ANNs are crucial to machine learning (ML) and the development of the larger area of artificial intelligence (AI). ANN is built on top of the biological concepts of the human brain. Though it is a must to understand the functioning concept of the human brain to understand the root of ANN.

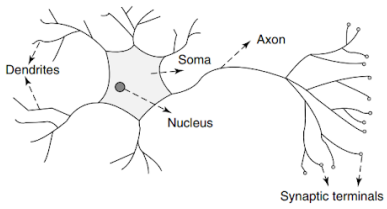


Figure 1: *Mammalian Neuron*

The human brain is a sophisticated network of neuronal connections. It can recognition of faces, and speech, control body movements and body functions, as well as brain, can conduct computation-intensive perceptual actions.

The human brain contains more than 10 billion interconnected neurons. Each neuron can be called a cell these cells use biochemical reactions to receive, process, and transmit information. There are networks of nerve fibers called dendrites(Figure1). These dendrites are connected with the cell body or soma(the location of the cell nucleus). The axon, a single lengthy fiber that extends from the cell body, ultimately forks into strands and sub-strands and connects to neighboring neurons through synaptic terminals or synapses. Specific transmitter molecules are released from the sending end of the junction during the complicated chemical process of signal transmission at synapses. The result is a change in the electrical potential within the receiving cell's body. A pulse is delivered down the axon and the cell is "fired" if the potential exceeds a cer-

tain level. ANNs are developed based on this scientific process.

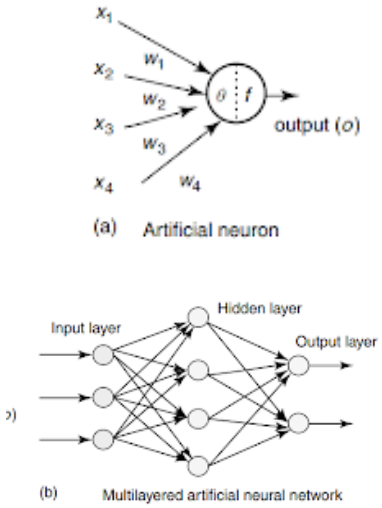


Figure 2: *Architecture of an artificial neuron and a multilayered neural network*

ANNs have been created As an abstraction of mathematical models of actual nerve systems. Artificial neurons are the basic processing elements of neural networks (Figure2).In a concise mathematical model of the neuron, connection weights that alter the impact of the related input signals are used to describe the synaptic effects, and a transfer function is used to depict the neurons' nonlinear behavior. In the ANN architecture, there are three types of neuron layers Input layer, hidden layer, and output layer. Normally in feed-forward network signals flow from input to output layer in a straight manner, this data processing can be extended over multiple layers but there are no feedback connections. Although recurrent networks provide feedback connections. In contrast to feed-forward networks, the network's dynamical features are important. In some circumstances, the activation values of the units go through a relaxation process, leading to the network evolving to a stable state where these activations no longer change. In other applications, the output of the network has dynamical behavior because changes in the activation levels of the output neurons are significant. There are a few more architectures such as the Elman network, adaptive resonance theory maps, competitive networks, etc. They are depending on the properties and requirements of the application.

The backpropagation algorithm, the delta rule, and the perceptron rule is the most famous example of this scenario. In unsupervised learning, the output will be trained to reply to the clusters of patterns inside the input. According to this concept, the system should identify statistically significant characteristics of the input population. There are no predetermined categories into which the patterns are to be classified, unlike the supervised learning paradigm. Rather, the system must create a representation of the input stimuli that is unique to it. Learning what to do and how to map situations to actions in order to maximize a numerical reward signal is known as Reinforcement learning. Most of the time in machine learning the learner does not know which action should be taken. Instead of that, they have to find out which actions are the most rewarded by trying each one of them. In the most fascinating and tough situations, decisions might have an impact on the future circumstance as well as the immediate reward and all rewards that come after. Trial-and-error search and delayed reward are the two most important characteristics of reinforcement learning.

In neural network learning, there is a method called Hebbian learning. The formal assertion of how learning may occur was the most significant idea to come from Hebb's study. The alteration of synaptic connections between neurons served as the foundation for learning. Particularly, when a cell A axon is close enough to stimulate a cell B and engages in firing frequently or persistently it, some type of metabolic or growth activity occurs. To the extent that A's effectiveness, B will be increased as one of the functioning cells. This statement's core concepts have come to be known as Hebbian Learning. The Hebbian learning rule is essentially the basis for the majority of neural network learning approaches. The fundamental tenet is that when two neurons are engaged at the same time, their connections must be boosted. One of the coupled neurons in a single layer net will serve as an input unit and the other as an output unit.

A single-layer neural network called a perceptron can have its weights and biases taught to output the right target vector when given the right input vector. The perceptron learning rule is the name of the training method utilized. Particularly well-suited for straightforward pattern categorization issues are perceptron.

When it comes to backpropagation learning, if we take this derivative's inverse, or the weight value as a function of the rate of mistake change grows, continue to add it to the weight, and finally make the mistake until it reaches a local minimum, will diminish. This results positive derivative indicates that something is true, therefore as the weight increases, the inaccuracy gr-

ows as well. Then adding a negative number to the equation is the logical thing to do next. Weight if the derivative is negative, and vice versa. This approach is known as the backpropagation algorithm because it applies these partial derivatives to each of the weights, starting from the output layer to the hidden layer weights and then from the hidden layer to the input layer weights.

The linearly separable or linearly independent issues are the only ones that the basic perceptron can tackle. By using the partial derivative of each weight's contribution to the network's error. The error will reduce until it achieves a local minimum if we take the negative of this derivative (i.e. the rate change of the error as the value of the weight grows) and add it to the weight. This makes it obvious because a positive derivative indicates that the mistake is growing as the weight increases. If the derivative is negative, it is apparent to add a negative number to the weight and vice versa. Because each weight is affected by these partial derivatives, which are taken and applied to start with the output layer's weights and end with the hidden layer's weights.

The ideal method of instruction is to gather a variety of examples that represent all the many aspects of the issue. In certain circumstances, some noise or other randomness is added to the training data to acquaint the network with noise and inherent unpredictability in actual data to construct a resilient and dependable network.

An unstable and unpredictable network is a natural result of poor training data. The network is typically trained for a predetermined number of epochs or when the output error falls below a specific error threshold. It is important to take extra caution not to overtrain the network. The network may become overly adaptive in learning the samples from the training set as a result of overtraining, making it difficult for it to appropriately identify data.

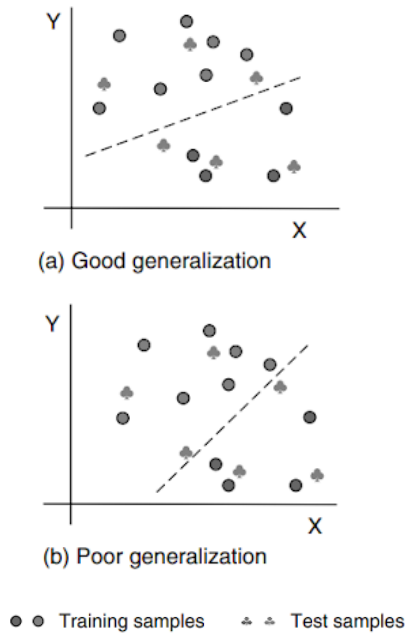


Figure 3: *Illustration of generalization performance*

The effectiveness of the network's ability to segregate the data depends on the number of hidden neurons. Correct learning will be ensured by a high number of hidden neurons, and the network can accurately forecast the data it was trained on but its performance on fresh data, its generalizability, is in jeopardy. The network's hidden neurons are insufficient, may be unable to understand the connections between the data and the inaccuracy won't be reduced to an acceptable level. Therefore, choosing the number of buried neurons is a vital choice.

Using the steepest descent approach, the learning process descends steeply in weight space until the arrival at the first valley. Due to this, it is crucial to select an initial beginning point in the multidimensional weight space.

However, other than experimenting with a variety of beginning weight values to determine whether the network outcomes are enhanced, there are no suggested criteria for this decision.

When each weight is updated, the learning rate efficiently regulates the amount of step that is taken in the multidimensional weight space. The local minimum may be continuously overstepped if the chosen learning rate is too high, leading to oscillations and a sluggish convergence to the lower error state. Slow performance might come from a high number of iterations if the learning rate is too low.

BP (backpropagation) frequently becomes stuck at a local minimum, mostly as a result of weight initialization that is random. While the same network can achieve an ideal minimum for certain initializations, other initializations may prevent BP from reaching a global minimum of the weight space. The weights are optimized using one of four categories of optimization algorithms. The operation of the first three methods gradient descent, conjugate gradients, and Quasi-Newton can be described in terms of minimizing a quadratic error function. These methods are all generic optimization techniques.

Different designs and activation functions are investigated to determine how well the constructed neural network performs.

For some values of the parameters x(0) and, the Mackey-Glass differential equation exhibits a chaotic time series (Figure 4).

$$\frac{dx(t)}{dt} = \frac{0.2x(t-\tau)}{1+x^{10}(t-\tau)} - 0.1\ x(t).$$

Figure 4: *The Mackey-Glass differential equation.*

Through this article, we have discussed the foundations of Artificial Neural Networks such as how the human brain concept has been involved in Artificial Neural Networks, The architecture of the ANNs, and the Hebbian learning method as well as the perceptron rule.

After these fundamentals, we discussed Backpropagation learning, Training and testing neural networks, higher-order learning algorithms, and how to design an ANN. It is an amazing thing human brain is the most complex system in the world and Artificial Neural Network has been built based on the process of the human brain.

STAFF HIGHLIGHTS

It is our great pleasure to congratulate Professor B.T.G.S. Kumara on his appointment as the Director of the Centre for Research and Knowledge Dissemination of the Sabaragamuwa University of Sri Lanka (CRKD-SUSL).

He has served in a variety of administrative capacities. He served as the Head of the Department of Computing & Information Systems at the Faculty of Applied Sciences from May 2017 to May 2020. Furthermore, starting in 2020, he is serving as the Chairman of the Board of Study in Computing at the Faculty of Graduate Studies, SUSL, and as the Chairman of the Board of Study of the Faculty of Applied Sciences, Center for Open and Distance Learning, SUSL.

He is a well-known researcher in the fields of Web Service Clustering, Big Data Analytics, Data Mining, and Image Processing. His publication of several scholarly book chapters and research articles in indexed journals, peer-reviewed online journals, national and international conferences and symposia, demonstrate his flair for competence in the fields of research and knowledge dissemination. He is also rendering his service as a member of the programme committee for a number of local and international conferences, a reviewer and an associate editor of reputed journals, and a guest editor of reputed journals including Complexity - Special Issue "Advanced Sparse Machine Learning (ASML) and Future Internet – Special Issue "Automating Process of Big Data Analytics Using Service Composition".

proximal operator of the learnable sparse regularizer simultaneously with a sparse solution. The convex minimization for the dictionaries and the coefficients can be obtained via the accelerated proximal gradient and the optimal condition, respectively. In the numerical classification and reconstruction experiments, the proposed algorithm outperformed existing DDL algorithms in terms of classification accuracy, image reconstruction, and noise immunity.

THE FACULTY OF COMPUTING IN THE EYES OF ALUMNI

Mr. Isuru Abeywardana
Software Engineer
SWAT mobility Pte Ltd.
Singapore

Hello,

I'm Isuru Abeywardana and currently working as a Software Engineer in Singapore. Congratulations to the Faculty of Computing on the transformation of the department into a new faculty! As an alumnus of the sixth batch of the computing and information system department, I have witnessed the remarkable growth and progress of the department over the years. I am thrilled to see that the hard work and dedication of the faculty, staff, and students have led to this achievement. I offer my warmest congratulations and best wishes to everyone who contributed to this milestone, and I hope that the faculty will continue to flourish and produce exceptional graduates who will make a positive impact on the computing field.

With the new resources and facilities available, I have great expectations for the students who are studying in the Faculty of Computing and look forward to seeing more achievements in the future.

Ms. Nivarthana Sandeepani
Software Engineer
TIQRI (Pvt.) Ltd.
Sri Lanka

Hello everyone,

As a software engineer and entrepreneur, I'm passionate about using technology to drive innovation and create value. I'm also deeply committed to sharing my knowledge and experience through tech talks and other community events. I owe much of my success to the solid foundation I received in my BSc (Special) in Computing and Information Systems. This degree provided me with a comprehensive understanding of the principles and practices that underpin the software engineering field.

It's exciting to see that my alma mater, the Faculty of Computing at the University of Sabaragamuwa, has expanded to include three new degrees in software engineering, data science, and computing and information systems. This expansion means that students now have access to a wider range of courses and opportunities to develop their skills and knowledge.

As someone who has benefited greatly from my own education in computing and information systems, I'm thrilled to see the faculty grow and evolve in this way. I believe that the skills and knowledge students gain from these programs will equip them to tackle the challenges and opportunities of the rapidly changing tech landscape.

I'm excited to see what the future holds for the Faculty of Computing at the University of Sabaragamuwa, and I'm proud to be an alumna of such a dynamic and forward-thinking institution.

USAGE OF BLOCKCHAIN FOR THE BANKING INDUSTRY

Mr. W.M.C.J.T. Kithulwatta *(chiranthajtk@gmail.com)*

The writer is a Lecturer (Probationary) at the Department of Information and Communication Technology, Faculty of Technological Studies, Uva Wellassa University of Sri Lanka, Badulla.

The popularity of blockchain technology has grown recently, and many businesses are looking into its potential applications such as financial services, healthcare, energy & utilities, supply chain management, and government services (examples: voting systems, identity verification, and land registration.). This technology has received too much attention from the banking sector. Blockchain technology can be used in a range of practices to improve the efficiency and security of financial transactions.

Blockchain technology is a distributed, decentralized digital ledger that is used to securely and openly record transactions. It was initially presented as the underlying technology for the virtual currency Bitcoin, but it has subsequently been used in a variety of fields and scenarios. A blockchain is essentially a network of computers that maintains a database. A record of multiple transactions is kept in each block of the chain, and once a block is added to the chain, it cannot be changed without also altering all preceding blocks. As a result, a permanent, unchangeable record of every transaction that has ever taken place on the network is produced.

Figure 1: *Recording moments of supply chain [Image Source: https://www.visiott.com/blog/blockchain-traceability/]*

The traceability of such processes in the enterprise-level supply chain should be established to provide transparency and credibility. Hence, by using the blockchain, all moments of the product will be recorded digitally. Figure 01 presents such moments of a product in a supply chain and how those will be recorded in a blockchain.

It relies on a network of computers to validate and record transactions rather than a single authority or middleman to authenticate trans-

actions because blockchain technology is a decentralized approach. This makes it a very transparent and safe technology that can be applied to many different fields, including supply chain management, healthcare, and finance. This article offers a wealth of knowledge regarding the application of the blockchain idea in the banking sector.

Blockchain technology can be used to increase the speed and efficiency of financial transactions. One of the primary advantages of blockchain technology is that it enables rapid and secure transactions without the need for intermediaries. In contrast to conventional techniques, blockchain technology enables banks to transfer funds across accounts more quickly and inexpensively. While transactions are recorded in a decentralized ledger that is visible and unchangeable, blockchain technology allows banks to lower the risk of fraud and error.

Further, the security of banking activities can be increased using blockchain technology. Information may be shared and stored in a very secure, decentralized manner thanks to blockchain technology. Blockchain technology enables banks to securely store client information and transaction data, lowering the likelihood of data breaches and cyberattacks. Blockchain technology can also be used to confirm a customer's identification and guarantee that only authorized parties have access to sensitive data.

Moreover, banks can leverage blockchain technology to lower their compliance expenses. The implementation of the tight laws and compliance standards that apply to banks can be time-consuming and expensive. Banks can automate many of these procedures using blockchain technology, cutting down on the need for manual intervention and lowering the possibility of mistakes. This can result in substantial cost savings for banks and an all-around more effective regulatory procedure.

Eventually, new financial services and products can be developed using blockchain technology. For example, banks can employ blockchain technology to construct digital currencies and other blockchain-based financial instruments. These goods and services can be leveraged to give clients more financial freedom and new investment opportunities.

Blockchain technology can simplify the process of opening bank accounts and obtaining loans by reducing the need for intermediaries, improving the efficiency and accuracy of the identity verification process, automating loan agreements, and providing greater transparency in the loan application and approval process.

Further, blockchain technology can be used to build secure, decentralized digital identities, which can be especially helpful for anti-money laundering. Banks and other financial institutions may make sure that customers are who they say they are and can more easily identify and stop fraudulent conduct by utilizing blockchain to store and verify digital identities. A common database of digital identities that can be accessed by various financial institutions is one way that blockchain can be utilized for anti-money laundering. When institutions may verify the same identity using the same set of data, identity verification may become more efficient and effective as a result. Blockchain technology can make databases transparent, safe, and impenetrable, which can boost confidence in the verification process. Blockchain can also be used to produce a safe, unchangeable audit trail of every financial transaction, which can be used to identify and stop money laundering. Banks and other financial institutions can spot possible money laundering activity more quickly and precisely by utilizing blockchain to trace the transfer of funds and spot questionable behavior. As a result, they may be able to take proactive measures to stop money laundering, like freezing assets or alerting regulatory authorities to transactions that seem suspect.

A common database of digital identities that can be accessed by various financial institutions is one way that blockchain can be utilized for anti-money laundering. When institutions may verify the same identity using the same set of data, identity verification may become more efficient and effective as a result. Blockchain technology can make databases transparent, safe, and impenetrable, which can boost confidence in the verification process.

Since a few years ago, the banking sector has been investigating the use of blockchain technology, and the sector already uses several blockchain-based applications. Here are a few illustrations:

1. Cross-border payments:

Cross-border payments are one of the most exciting uses of blockchain technology in the financial sector. By lowering the number of middlemen in the transaction, blockchain can help international transfers be quicker, cheaper, and more secure.

2. Trade finance:

Trade finance is another sector of banking where blockchain technology is being employed. Banks can lower fraud, boost transparency, and quicken the trade finance process by using blockchain to trace the flow of goods and the accompanying financial transactions.

3. Know Your Customer (KYC):

KYC is a legal obligation that banks must adhere to, which entails confirming the legitimacy of its clients. Blockchain can be used to build safe, decentralized digital identities, which could speed up, improve efficiency, and strengthen the security of the KYC process.

However, blockchain brings some key challenges and risks when developing blockchain-based applications:

1. Technical complexity:

The development and deployment of blockchain-related apps demand particular knowledge and experience due to the complexity of the technology. Due to this, it may be challenging for businesses to locate the appropriate personnel and knowledge to implement blockchain technologies.

2. Regulation and compliance:

The legal and compliance framework for blockchain technology is still developing, which can lead to confusion and make it challenging for businesses to handle these concerns. This is especially true in sectors with high regulatory standards, including finance and healthcare.

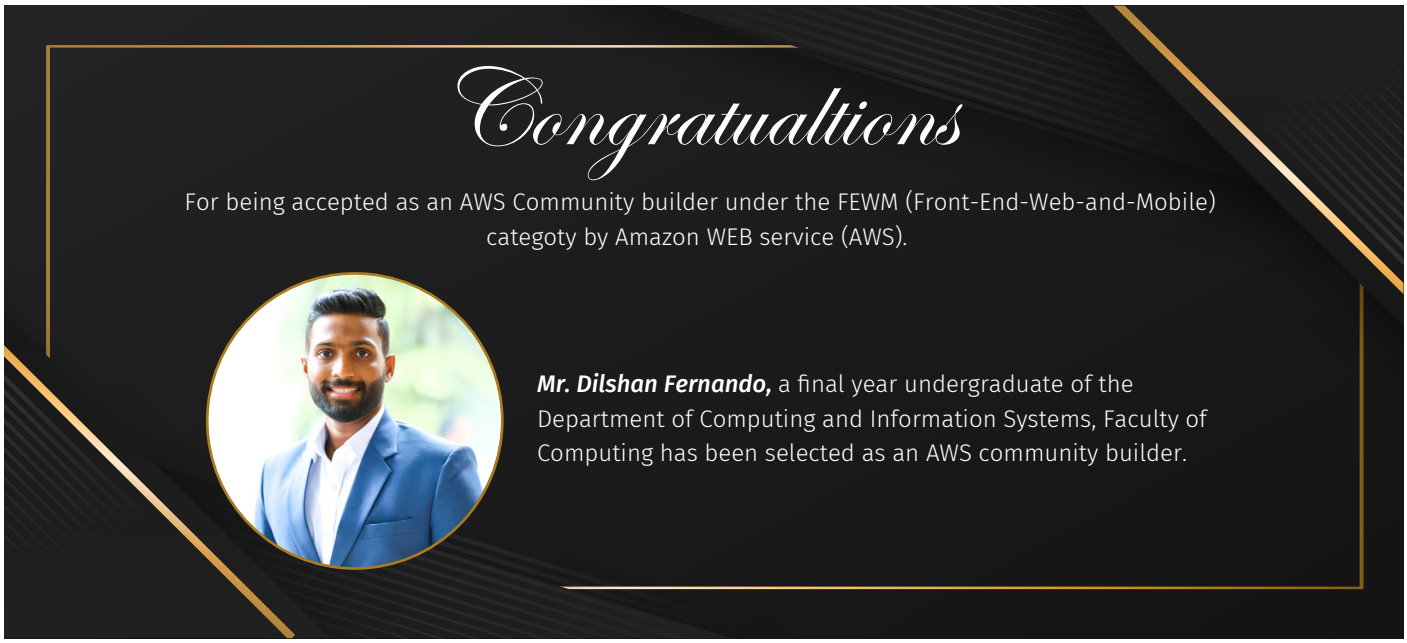
3. Adoption:

Since blockchain technology is still in its infancy, stakeholders used to more established systems and procedures might be reluctant to adopt it. For businesses trying to develop blockchain applications, this can present difficulties that may call for intensive education and outreach initiatives to resolve.

4. Security:

While being frequently praised for its security, blockchain technology is not impervious to hackers and other security risks. A blockchain network's vulnerability could jeopardize the system's integrity and security as a whole.

Thus, blockchain technology has the potential to revolutionize the banking sector. It is a desirable choice for banks seeking to enhance their operations and provide clients with new goods and services due to its speed, security, and efficiency. We will probably see even more cutting-edge applications for blockchain technology in the financial sector and elsewhere as it develops.



The 3rd International Conference on Advanced Research in Computing
ICARC 2023

The 3rd International Conference on Advanced Research in Computing - ICARC 2023 organized by the Faculty of Computing, Sabaragamuwa University of Sri Lanka was successfully held on 23rd and 24th February 2023. In an era of digitalization where digital solutions play a critical role in the successful transformations of activities for sustainable developments in all spheres, the conference this year was held under the theme "Digital Transformation for Sustainable Development". The Inauguration Ceremony was held at the Faculty of Geomatics Auditorium with the graceful presence of Professor R.M.U.S.K. Rathnayake, the Vice Chancellor of Sabaragamuwa University of Sri Lanka and the Guest of Honour Professor Buddhika Jayasekara, the President of the IEEE Sri Lanka Section for the Year 2023. Various other distinguished guests including academics, industry professionals, and well-wishers were present at the ceremony. The Technical Sessions were held in both ways physically and virtually at the Faculty of Applied Sciences.




This is the first international conference organized by the Faculty of Computing after it was converted as a Faculty. The Faculty of Computing takes pride in remarking that ICARC 2023 was technically co-sponsored by the IEEE Sri Lanka Section, IEEE Computer Society of Sri Lanka, and the Sri Lankan Chapter of IEEE Communications Society, with the papers published in IEEE Xplore Digital Library. The conference was also recognized by the IEEE Women in Engineering (WIE) Sri Lanka Section. Since its debut in 2021, ICARC has attracted a lot of interest for the broad breadth and excellent quality of research papers it has received. Sixty One full papers received both locally and internationally were presented this year under twelve tracks namely Artificial Intelligence and Machine Learning (15), Computer Vision and Image Processing (05), Text Analytics and Natural Language Processing (07), Data Analytics (02), Parallel and Distributed Computing (01), Software Engineering (06), Knowledge Management and Information Systems (04), Internet of Things and Applications(03), Human-Computer Interaction (04), Technology-enhanced Learning and Teaching (04), Industry Research and Development (05), and Open Track (05). This year's conference was a collective effort empowered by a group of distinguished academics and professionals who served in the Advisory Panel, the Organizing Committee, and the Technical Program Committee that were represented by members from around the world.




The conference brought together eminent keynote speakers, plenary speakers,and special guest speakers

composed of intellectuals, professionals, and entrepreneurs all on one platform, allowing the attendees to discuss recent innovations, technologies, and trends in a variety of computing disciplines. A keynote address on Managing identity in the next generation of decentralized internet was delivered by Professor Muttukrishnan Rajarajan from the Department of Electrical and Electronic Engineering, School of Science and Technology, City University of London, United Kingdom. A keynote address was also delivered on Blockchain for 5G and Beyond Networks by Assistant Professor Madhusanka Liyanage, Assistant Professor/Ad Astra Fellow and Director of Graduate Research, Department of Electrical Engineering, University College Dublin, Ireland. Furthermore, a special guest speech on Innovation and Sustainability was delivered by Dr. Harsha Subasinghe President and CEO · CodeGen. Also by representing WIE and inspiring the female undergraduates and attendees, a speech on Women in STEM was delivered by Mrs. Nita Patel, President - IEEE Computer Society - 2023, IEEE HeadQuarters , Washington, D.C. USA.

ICARC 2023 also featured a number of pre-conference workshops and tutorials organized with the aim of enhancing knowledge and understanding of the participants, fostering collaborations, and especially to aspire for tomorrow's computing professionals. Learner-Centered Edtech Design using Learning Analytics and Human-Computer Interaction:

A case study of MOOCs, Object Detection/classification with Deep-Learning and 3D Point Cloud Data, Identification of Hate Speech in Social Media were all covered in the workshops. Internet of Things - Theory and Practice and Software Reliability Detection and Mitigation in Distributed Platforms were among the topics covered in the tutorials. Realizing the pledge of IEEE WIE to work towards gender-diversified panels at all IEEE meetings, conferences, and events, the WIE Affinity Group of SUSL organized a discussion on Demonstrating Gender-based Diversity, Equity, Inclusion & Belonging to unleash the collective Systemic potential in parallel to ICARC 2023. Furthermore, as a new starting, WIE Affinity Group of SUSL organized the “PearlHack", an inter-university idea hackathon targeting all the female undergraduates in Sri Lanka with the main intention of encouraging female undergraduates towards innovations and inspiring creativity, collaboration, and critical thinking. All the winners of the PeralHack were awarded at the Inauguration Ceremony of ICARC 2023.

The conference this year along with the contribution of SUSL towards a digitally empowered society was a dynamic and productive experience for all the attendees

and we hope that ICARC 2024 would be even better with your participation and collaboration.

TPC Members of the conference

Technical Program Chair
Prof. S. Vasanthapriyan
Sabaragamuwa University of Sri Lanka

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Dr. Lochandaka Ranatunga
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Prof. B.T.G.S. Kumara
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Computer Vision and Image Processing Track

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University of Jaffna (Chair)

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Text Analytics and Natural Language Processing Track

Dr. Sagara Sumathipala
University of Moratuwa (Chair)

Mr. K. Banujan
Sabaragamuwa University of Sri Lanka (Co-Chair)

Data Analytics Track

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University of Kelaniya (Chair)

Prof. Kapila Rathnayaka
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Dr. Windhya Rankothge
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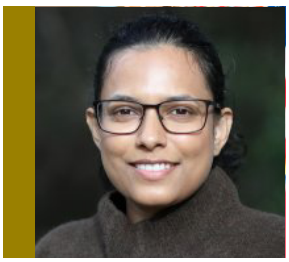

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Dr. Hiruni Rupasinghe
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General Sir John Kotelawala Defence University (Chair)

Ms. Nirubika Ravikumar
Sabaragamuwa University of Sri Lanka (Co-Chair)

BOOST YOUR PRODUCTIVITY: UNLEASHING THE POWER OF CHATGPT'S AI CAPABILITIES

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The writer is a researcher at the USE HCI LAB, University of Colombo School of Computing, with a shared interest in Human-Computer Interaction and a wealth of experience in his respective fields of research.

The writer is a senior lecturer and a researcher at the USE HCI LAB, University of Colombo School of Computing, with a shared interest in Human-Computer Interaction and a wealth of experience in his respective fields of research.

"In today's fast-paced world, productivity has become a crucial factor for success both in our personal and professional lives. It is the ability to get things done efficiently, effectively, and in a timely manner. However, with the increasing amount of distractions and demands on our time, it can be challenging to maintain high levels of productivity. Fortunately, with the help of AI technology like ChatGPT, we can unleash its power to increase our productivity.

AI technology has been transforming various industries and sectors, and productivity is no exception. AI-powered tools like ChatGPT can help us manage our tasks, organize our schedules, and provide us with real-time support and solutions. In this article, we will explore how ChatGPT's AI capabilities can help us boost our productivity in our personal and professional lives."

How ChatGPT Works

ChatGPT is an AI-powered chatbot developed by OpenAI that can engage in conversations with users and provide them with relevant and accurate information. It works by using advanced natural language processing techniques to understand the user's input and generate a response that is both informative and contextually appropriate.ChatGPT is powered by a massive neural network that has been trained on a vast amount of text data, making it capable of generating human-like responses to a wide range of questions and prompts. It is constantly learning and updating its knowledge base, which means that its responses are becoming more accurate and comprehensive over time.

ChatGPT's AI capabilities include the ability to understand natural language input, generate text-based responses, and provide personalized recommendations based on user preferences and behavior. It can also recognize patterns and trends in data, making it an effective tool for data analysis and decision-making.With its advanced AI capabilities, ChatGPT is a powerful tool for boosting productivity by providing quick and accurate responses to users' queries and offering personalized recommendations based on their individual needs and preferences.

ChatGPT's Productivity-Boosting Features.

ChatGPT's AI capabilities make it an ideal tool for boosting productivity in a number of ways. Here are some of its most useful features:

Generating ideas and solutions: ChatGPT's massive knowledge base and natural language processing capabilities

make it a valuable resource for generating ideas and solutions to problems. By simply asking ChatGPT for help with a particular challenge or brainstorming session, it can generate a range of ideas and solutions that users may not have thought of otherwise.

Providing answers to questions and offering explanations: ChatGPT is also highly skilled at answering questions and providing explanations on a wide range of topics. This can save users valuable time and effort in researching and finding answers on their own.

Offering suggestions for improving workflow and efficiency: ChatGPT's ability to analyze patterns and trends in data can also be useful in identifying areas for workflow and efficiency improvements. By providing personalized suggestions for how to optimize tasks and processes, ChatGPT can help users streamline their work and achieve more in less time.

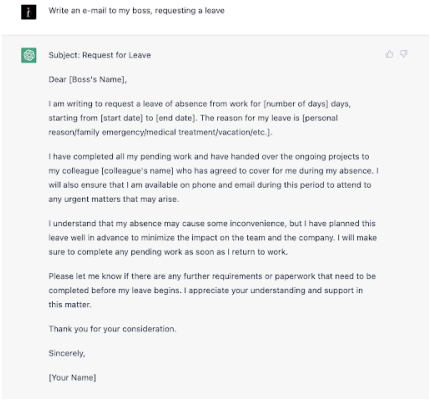
Providing reminders and setting deadlines: Finally, ChatGPT can also act as a virtual assistant by providing reminders and setting deadlines for important tasks and projects. This can help users stay on track and avoid procrastination, ultimately leading to greater productivity and success.

ChatGPT's AI capabilities make it a versatile and powerful tool for increasing productivity in a wide range of contexts. By providing quick and accurate responses to users' queries and offering personalized recommendations based on their individual needs and preferences, it has the potential to revolutionize the way we work and achieve our goals.

Examples of ChatGPT in Action.

ChatGPT's productivity-boosting features have helped numerous individuals and organizations to achieve more in less time. Here are some real-life examples of how ChatGPT has been used to increase productivity:

Personal productivity: Many individuals have successfully used ChatGPT to manage their daily tasks, such as setting reminders, organizing their schedules, and generating ideas. One user reported that ChatGPT helped them to brainstorm and plan out a complex project in a matter of hours, rather than days.



Customer Service: ChatGPT's ability to understand natural language input and generate accurate responses has made it a popular tool for customer service. Companies such as Hugging Face and Nuggs have successfully implemented ChatGPT-powered chatbots to handle customer inquiries and support, freeing up staff time and improving response times.

Content Creation: ChatGPT's natural language processing capabilities have also been used to generate written content, such as blog posts and marketing copy. Companies such as Copy.ai and Jarvis have developed tools that use ChatGPT's AI capabilities to generate high-quality, engaging content quickly and efficiently.

Workflow optimization: Finally,Companies like OpenAI have used ChatGPT to optimize their own workflows and operations. By using ChatGPT to automate certain tasks, such as generating meeting agendas and scheduling appointments, they have been able to free up staff time and increase overall productivity.

These examples demonstrate a the wide range of applications for ChatGPT in increasing productivity, both on an individual and organizational level. By leveraging its AI capabilities, users can achieve more in less time, freeing up valuable resources and ultimately driving success.

ChatGPT's AI capabilities make it a powerful tool for increasing productivity in a variety of contexts. Whether you're an individual looking to manage your schedule more efficiently, or a business looking to optimize your operations, ChatGPT can help you achieve more in less time.By generating ideas and solutions, providing answers and explanations, offering workflow suggestions, and setting reminders and deadlines, ChatGPT can help you streamline your work and achieve your goals. And with real-life examples of successful implementation in industries like customer service, content creation, and workflow optimization, it's clear that ChatGPT's capabilities have the potential to drive success at all levels. Therefore,So if you're looking to boost your productivity, why not give ChatGPT a try? With its natural language processing capabilities and vast knowledge base, it's a valuable resource for anyone looking to achieve more in less time. Explore its capabilities and see how it can help you be more productive today!

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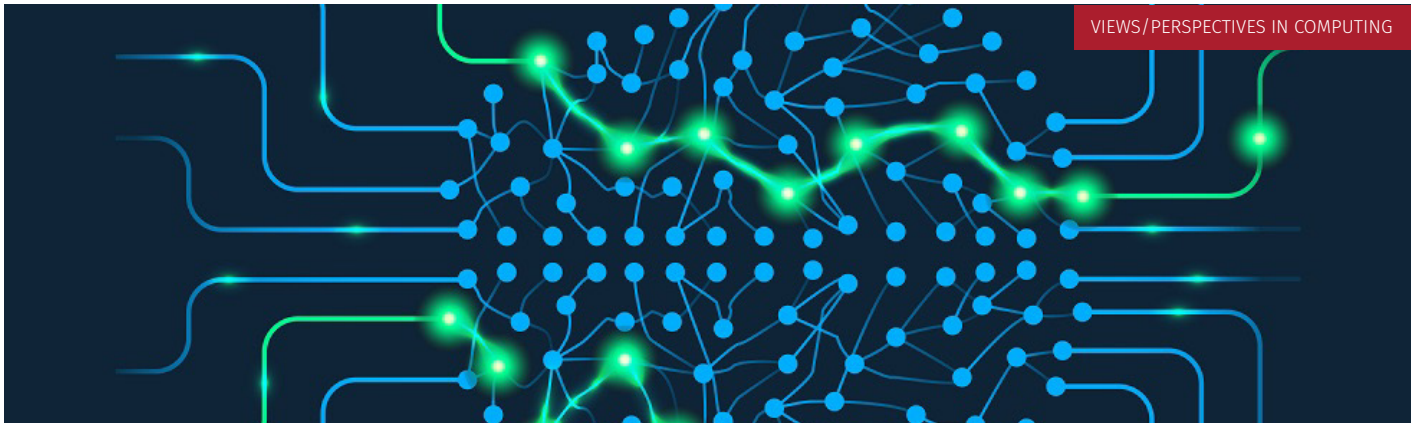

CATASTROPHIC FORGETTING IN NEURAL NETWORKS

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The writer is a final year undergraduate who is following a BEng (Hons) Software Engineering degree at the Informatics Institute of Technology affiliated with the University of Westminster, UK. Her research interests include Machine Learning, Deep Learning, and Neural Networks

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Keywords: *Artificial Intelligence (AI), Catastrophic Forgetting (CF), Machine Learning (ML), Neural Networks (NN)*

With Machine Learning (ML) has guided the construction of many remarkable Artificial Intelligence (AI) systems to overcome complex real-world issues. Building an agent who performs in a good manner with multiple tasks and the capability of learning tasks consecutively, are long-standing research goals of ML. Neural Networks (NNs) are an ML architecture inspired by neural connections of the human brain. NNs lead to resolving complex scenarios due to their powerful learning capabilities. NNs computations authorize a significant number of tasks in the AI domain. Advanced Deep Neural Networks (DNNs) should have the capability to survive in a highly dynamic environment. Such dynamic adaption is essential in Continual Learning (CL). CL leads NNs to forget the previously learned information, which is known as Catastrophic Forgetting (CF) (McCloskey & Cohen, 1989). The inflexibility of this issue produces a key barrier in Sequential Learning (SL). In general, NNs are unable to learn consecutively due to the CF phenomenon which is an unavoidable property in connectionist applications.

Learning several skills for multiple tasks is a long-standing goal of AI which exceeds the intelligence of humans in various viewpoints. DNN model training requires considerable data and resources for computing. However, it is far away from becoming a generalized model. Training a model cannot concatenate to one task. Therefore, the approach should be a CL task and when the model is finished with training on previous data, we have to constantly train with new data for inference in model serving. Also, the latest data will be gathered at every moment. CF is a severe issue when the model is dealing with such dynamic data. Since DNNs need more data to train, they forget the previously learned tasks more severely t-

han traditional ML models. In addition, the aforementioned issue not only affects CL but also risks static training.

Forgetting mechanisms may affect ML in a good way or a bad way. A good way is to forget outdated data in SL, where many practical scenarios benefitted such as in natural language processing. Gathering many tasks, and information and acting concurrently is too costly. It is crucial to incorporate supervised and unsupervised approaches to gain high accuracy, flexibility, and stability in trained tasks. Supervised signals (Kemker et al., 2018), unsupervised signals (Munoz-Martin et al., 2019), and reinforcement learning (Klabjan & Zhu, 2020) methods apply to alleviate the threat of CF. These approaches can be categorized as architectural, functional, and structural approaches. The architectural approach reduces the CF by altering the network architecture to mitigate the inference of tasks without altering the functions of objectives, The functional approach includes regularization terms to decrease the changes in NN I/O functions, and the structural approach encourages parameters to stick to the parameters of previous tasks. Due to the resource requirement and significant training time consumption blockade the training frequency. Even though various approaches like “Learning without Forgetting” (Li & Hoiem, 2017) and “Elastic Weight Consolidation” (Kirkpatricket al., 2017) have been introduced to mitigate CF in the last four decades, still this is a considerable roadblock in CL.

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The Faculty of Computing, SUSL signs MoU with SLASSCOM

The Faculty of Computing (FoC), SUSL signed a Memorandum of Understanding (MoU) with the Sri Lanka Association for Software Services Companies (SLASSCOM) on February 01, 2023. SLASSCOM is the national chamber for the IT and BPM industry in Sri Lanka and is the catalyst for the 'Island of Ingenuity' ("IOI") brand which promotes Sri Lanka's ingenuity in knowledge solutions and innovation offerings. The MoU outlines the goals and objectives of SLASSCOM and the FoC in fostering university-industry partnerships and advancing such collaborations, further enabling the FoC to realize its vision to conduct undergraduate and postgraduate Degree Programmes committing to produce talented employable graduates of a world class standard having both technical and core professional skills.

The MoU was signed by Mr. Ashique M Ali, the Chairman of SLASSCOM and Senior Professor R.M.U.S.K. Rathnayaka, the Vice Chancellor of SUSL. Ms. Chamindā de Silva, the Executive Director of SLASSCOM, Mr. Dhammika Marasinghe, the Capacity Forum Lead, and Ms. Thathsara Kalubowila, the Programme Manager (Capacity Forum), and the academic staff of the Faculty of Computing took part in the event.

Following the signing, SLASSCOM held an awareness session for the students of the Faculty of Computing.

The numerous resources at SLASSCOM were introduced in the session including, the Future Careers BRIDGE Programme, Professional Skills Programme, and SLASSCOM Bootcamp—an open-source curriculum focusing on Software Engineering. With the help of the aforementioned resources, the FoC anticipates stronger partnerships in the future that will allow the students to advance their skills and enter the industry as industry-ready graduates

METAVERSE: THE FUTURE OF INTERNET IS JUST AROUND THE CORNER

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The writer is a lecturer at Sabaragamuwa University of Sri Lanka. He received his BSc. degree in Computing and Information Systems from Sabaragamuwa University of Sri Lanka.

With all the recent fuss in the tech industry, you have probably heard the buzzword "Metaverse", regardless of you being a technophile or not. ***But is this hype real? Is it the next significant breakthrough in tech?***

Well, some experts view it as the next phase in the evolution of the Internet, where the real-world meets with virtual and augmented reality. In contrast, some are having a contrary view and see it as a just gimmick and doubt its success. However, despite the uncertainty, tech giants like Meta, Microsoft, Apple, Epic Games and many more companies are investing billions of dollars on this emerging technology, expecting that it will totally reshape the global economy in future. It is estimated that the global market size of metaverse is expected to reach around $1607 billion by 2030 and expects a revenue CAGR of 50.74 % [1].

What is the metaverse, exactly? The concept of metaverse can be understood as a graphically rich virtual space with a degree of credibility, where people can work, play, shop, socialize. To put it more simply, it is an online platform where users can collaboratively do things as humans do in their real life using their digital avatars. The metaverse is not expected to compete with the Internet, rather it gets built on it. Experts called it the three-dimensional (3D) version of the Internet.

How did the concept come up? The idea of metaverse is not brand-new and the term was coined by the American writer Neal Stephenson in his science-fiction novel "Snow Crash" in 1992 [2]. In the novel, "metaverse" referred to a virtual-reality world where people can explore the world using digital avatars

of themselves using virtual reality headset and controllers. People could roam freely through this digital world and use digital currency to buy clothes, weapons and even real estate. However, in Snow Crash, Stephenson has introduced the metaverse as a means of escaping the dystopian reality expected in the 21st century.

How will it be built? In terms of development, metaverse is still in its early years and can be decades away from becoming fully operational. As of now, nobody knows about its features and capabilities or at least whether it's going to be just one massive all-encompassing metaverse or multiple metaverses. The elements of what may become the final output are still under wraps and underlying technologies are under development. However, top tech futurists are envisioning few existing technologies that will empower the metaverse projects.

VR and AR: These two technologies will play a crucial role in implementing the immersive and engaging 3D experience of metaverse and more importantly they will facilitate the interface between users and the virtual world. VR produces an entirely computer-generated virtual environment, while the real world is overlaid with digital visual elements in AR. As these two technologies become more mature in future AR will expand the capabilities of VR within the metaverse. Let's consider an example of a popular brand selling automobiles in their VR showroom within metaverse. VR only can provide an appealing virtual representation of the vehicles. But with use of AR, customers will be able to do a test drive in getting a more personalized experience prior to the product purchase.

Blockchain and Cryptocurrencies: This technology offers the decentralized and transparent environment required by the metaverse concept. Additionally, it also facilitates the implementation of features such as digital proof of ownership, transfer of value, digital collectability, governance, accessibility, and interoperability. Specifically, cryptocurrencies will play an important role in transferring value within the metaverse. Users will be able purchase products or services and even get paid from their employer or customer with crypto. In future we might even see reputed organizations setting up their branches online and offering metaverse-related jobs.

3D Reconstruction: This technology will play an important role in creating the realistic and natural-looking spaces within the metaverse. It will assist in maintaining photorealistic buildings, objects, and physical locations adhering to the general laws of science within the virtual world.

Artificial Intelligence (AI): AI is already changing our lifestyle with its potential to process massive amounts of data at a lightning speed, utilizing state-of-the-art machine learning algorithms. These capabilities of AI, allow the developers to use it for automation purposes during metaverse development. One such use is to implement realistic behavior of non-player characters (NPCs) in responding to the actions of the real users. Further, it can be utilized in designing more realistic digital avatars as per the specific characteristics of users.

IoT: This frontier technology uses sensors and devices in connecting the real world with the internet. Within the metaverse, it can enable the seamless connection between the real world and the virtual world resulting in a more efficient replication of the physical world. For example, in providing an integrated experience, behavior of certain objects within the metaverse can be manipulated based on an IOT data feed on the current weather conditions in the physical world.

On a final note, it is too early for predicting the future of metaverse, as the concept and the supporting technologies are still under evolution. However, the battle between tech companies to dominate the metaverse has already begun. Thus, the metaverse is expected to bring extreme opportunities not only for enterprises but also for its end users.

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AI TOOLS IN EFFECTIVE COMMUNICATION: REVOLUTIONIZING THE WAY WE INTERACT

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The writer is a Lecturer (Probationary) in Computer Science attached to the Department of Computing and Information Systems, Faculty of Computing. His research interests include Data Mining, Social Media Mining, Knowledge Management, and Ontology Modeling.

Artificial Intelligence (AI) has made significant strides in recent years, transforming various industries and improving the way we communicate. AI-powered tools have emerged as game-changers in the field of communication, making them more efficient, personalized, and accurate. The impact of AI tools on effective communication, it's revolutionizing, and the way we interact personally and professionally will be explored in this article.

AI-Powered Language Models

Natural Language Processing (NLP) is a subfield of AI that focuses on the interaction between computers and humans through natural language. AI-powered language models, like OpenAI's GPT-3, have demonstrated impressive capabilities in generating human-like text, answering questions, summarizing documents, and even translating languages. These models have the potential to greatly enhance the effectiveness of communication by automating tasks, reducing errors, and providing real-time assistance.

Automated Email Assistance

Email remains a primary mode of communication in professional settings. AI tools can improve the efficiency of email communication by analyzing user behavior, suggesting smart replies, and even drafting entire emails. For instance, Google's Smart Compose feature in Gmail uses AI to predict and suggest words or phrases as users type, reducing the time spent on writing emails and minimizing the chances of grammatical errors.

Chatbots and Virtual Assistants

AI-powered chatbots and virtual assistants have become ubiquitous in customer support, providing instant, accurate, and personalized responses to user queries. These tools

use NLP an-d machine learning algorithms to understand the context of user questions and generate relevant responses. By automating repetitive tasks and providing instant support, chatbots and virtual assistants improve communication efficiency and enhance customer satisfaction.

Speech Recognition and Voice Assistants

Voice assistants like Amazon's Alexa, Apple's Siri, and Google Assistant use AI-based speech recognition technology to understand and respond to voice commands. These tools have revolutionized the way we communicate with technology, allowing for hands-free interaction and making information more accessible. Additionally, AI-powered transcription services can accurately convert spoken language into written text, enhancing the clarity of communication and making it more accessible to individuals with hearing impairments.

Emotion Recognition and Sentiment Analysis

AI tools can analyze text, audio, and visual data to identify human emotions and sentiments, providing valuable insights into how messages are perceived. This technology can be used to tailor marketing strategies, improve customer service, and enhance interpersonal communication. By understanding the emotional context of communication, AI tools can help businesses and individuals create more empathetic, engaging, and effective messaging.

Conclusion

AI tools are transforming the communication landscape by making it more efficient, accurate, and personalized. As these technologies continue to evolve, more innovative solutions can be expected that will further revolutionize the way we interact with one another. By embracing the potential of AI in communication, we can unlock new possibilities for collaboration, problem-solving, and understanding across diverse contexts and platforms.

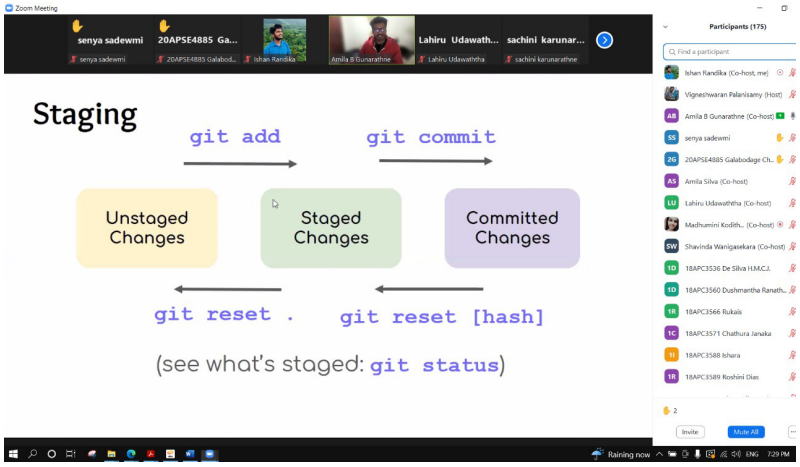
The Best Undergraduate Researcher of the Computing - Gold Medal

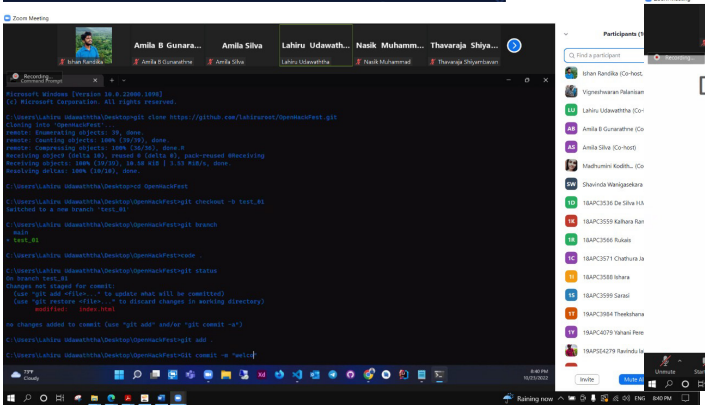
The Department of Computing and Information Systems, Faculty of Computing takes pride in congratulating Mohomad Ifham for winning “The Best Undergraduate Researcher of Computing - Gold medal” which is awarded by the Department of Computing and Information Systems to the student with the best research performance in Computing & Information Systems at the General Convocation of Sabaragamuwa University of Sri Lanka 2022.

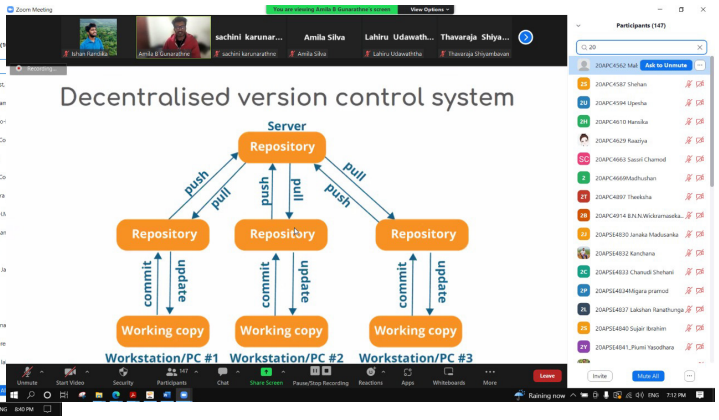
SOCIETY OF COMPUTER SCIENCES HIGHLIGHTS

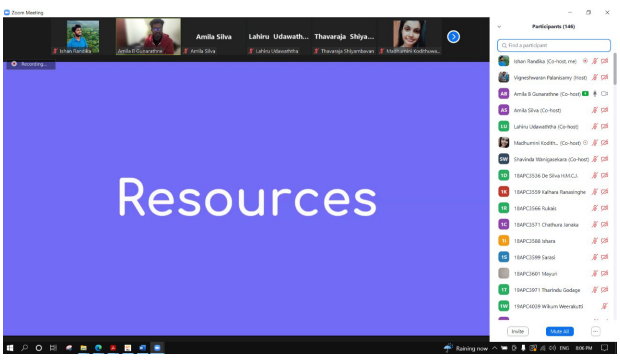
GITHUB AND AWARENESS FOR HACKTOBERFEST 2022

Society of Computer Science (SOCS) was organized a tutorial session on GitHub and awareness for Hacktoberfest 2022 which was held on 23rd October 2022 at 7.00 pm through online. The resource persons were Mr. Amila B Gunarathne, GitHub Campus Expert & Alumni of CIS and Mr. Lahiru Udawaththa, GitHub Campus Expert from NSBM Green University. Whilst,around 150 undergraduates from 1st,2nd and 4th year at the Department of CIS were actively participated and several students won the quiz conducted by the resource persons.







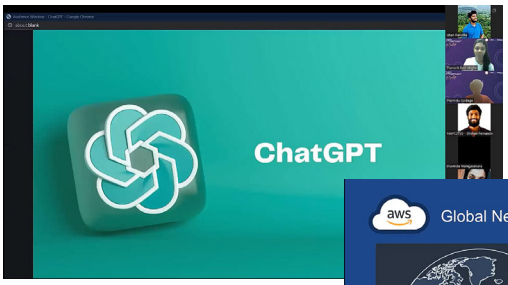


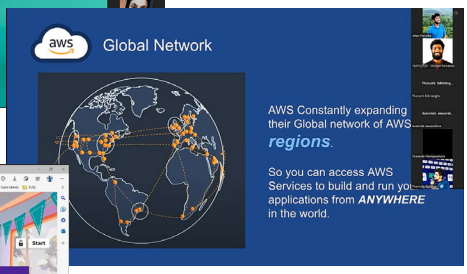
27TH CIS FORTNIGHT MEETUP

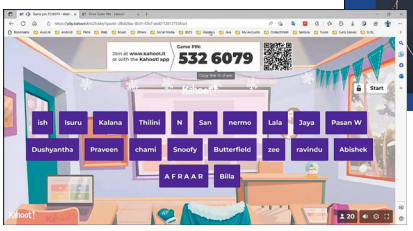
The 27th iteration of the CIS Fortnight Meetup, organized by the Society of Computer Sciences, was held on 12th of August 2022 at 6pm via Zoom, and it featured students from the Department of CIS discussing and presenting diverse technological topics. Pramith Wijethunga from 4th year and Hashan Danushka from 2nd year at Dept.of CIS were speakers for the event and did sessions on “Introduction to flutter development” and “Cyber Terrorism” respectively. Whilst,around 145 undergraduates from 1st, 2nd and 4th year at the Department of CIS were actively participated in this event.

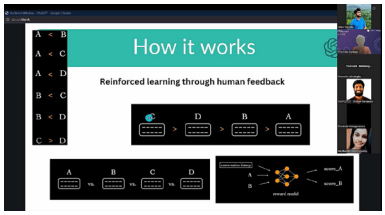
28TH CIS FORTNIGHT MEETUP

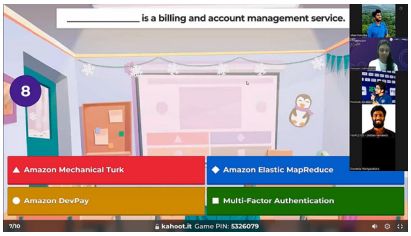
The 28th Fortnight Meetup The Society of Computer Sciences organized its highly anticipated 28th Fortnight Meetup on 5th of March, 2023, via Zoom at 6:00 pm, and was attended by over 150 participants. Ms. Tharushi Edirisinghe, a 3rd-year undergraduate, hosted the meetup. The first speaker, Mr. Dilshan Fernando, a 4th-year undergraduate, presented on "Introduction to AWS," providing valuable insights and new knowledge on the topic. The second speaker, Mr. Tharindu Godage, a 2nd-year undergraduate, gave a wonderful presentation on "ChatGPT." As an interactive and entertaining segment, the organizers conducted a Kahoot game for the audience. The questions were tailored to the topics covered in the event, and the audience participated enthusiastically. The winners of the Kahoot game were selected, and the event successfully concluded around 7.30 pm. Overall, the 28th Fortnight Meetup was a resounding success, providing valuable knowledge and fostering a spirit of collaboration and engagement among the attendees.

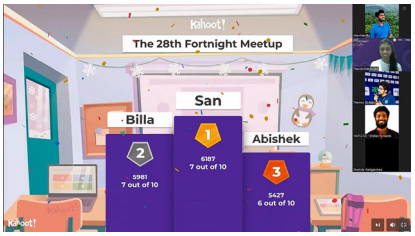












WOMEN IN ENGINEERING

PEARLHACK V1.0

The PearlHack V1.0 is an inter-university idea hackathon which was organized by the IEEE Women in Engineering Student Branch Affinity Group of Sabaragamuwa University of Sri Lanka in parallel to the International Conference on Advanced Research in Computing (ICARC) 2023. It was organized with the main intention of encouraging female undergraduates in Sri Lanka towards innovations and inspiring creativity, collaboration, and critical thinking. The participants were supposed to develop a method under the same theme of the conference which was "Digital Transformation for Sustainable Development" with an eye towards driving user engagement, enthusiasm, and exploration. The event was conducted as a virtual event with two selection stages. In the 'First Stage', the competitors were to form teams consisting of three members and submit the concept of the proposed idea and a complete analysis of it. Top 8 teams were selected as the semifinalists in this Stage under the guidance of a judge panel consisting of Dr. Pubudu Jayasena, Mr. Kuhaneshwaran Banujan and Ms. Upeksha Kudagamage. The 'Second Stage' which was the Grand Finale of PearlHack V1.0, was held on 17th of February 2023 as an online event with the semifinalists pitching their ideas live. Three outstanding teams who were the winners were selected in this Stage under the guidance and monitoring of a distinguished judge panel consists of Professor Maheshi Dissanayake from University of Peradeniya, Ms. Abarnah Kirupananda, the current Chair of IEEE Women in Engineering Sri Lanka Section, Ms. Tharaka Munasinghe, Business Analyst from Unicorn (PVT) LTD., and Mr. Sathira Bandaranayake, Software Engineer from SWOT Mobility. After much deliberation, the teams; Team Eclader from University of Colombo School of Computing, Team Codefellas from Sabaragamuwa University of Sri Lanka, and Team Code Mates from Sabaragamuwa University of Sri Lanka emerged victorious placing First, Second and Third places respectively.

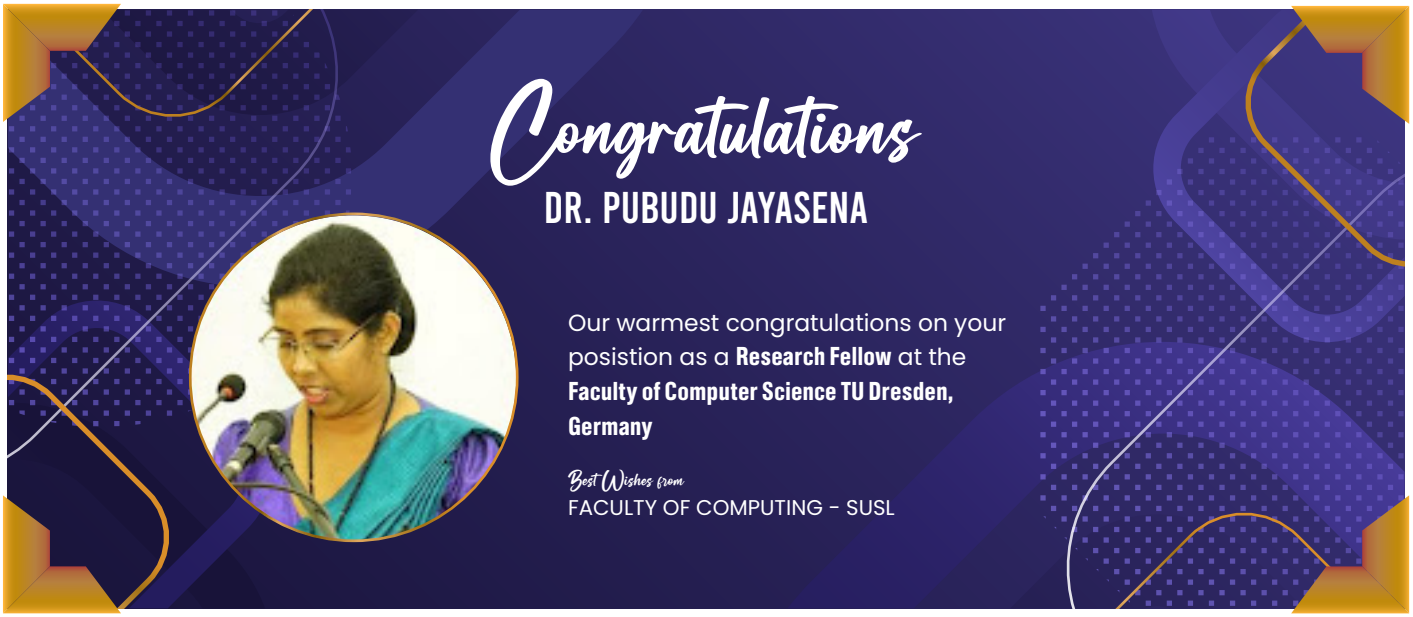
The awarding ceremony was held at the inauguration ceremony of International Conference of Advanced Research in Computing (ICARC 2023) on the 23rd of February 2023 at Sabaragamuwa University of Sri Lanka. The winners were awarded with certificates of achievement and cash prizes by Senior Professor Udaya Rathnayake, the Vice Chancellor of Sabaragamuwa University of Sri Lanka.

PearlHack V1.0 was a huge success, not only because it brought together students from different universities, but also because it provided them with a platform to give much deserved recognition to the innovative ideas of those precious pearls. It was an opportunity for female undergraduates to step out of their comfort zones and push their limits, and they were grateful for the experience. IEEE WIE Affinity Group of Sabaragamuwa University of Sri Lanka expects that the winners will continue to pursue their passions and develop the creative and innovative ideas which they proposed into commercially viable products and become successful female technopreneurs contributing to digital transformation for sustainable development.

STAFF HIGHLIGHTS

At present, the Faculty of Computing is empowered with a highly qualified and competent panel of academic staff including two professors, four senior lecturers and ten probationary lecturers. They are a very dedicated and enthusiastic group of people who have studied their subject area well and contributed to a large amount of research work. Some of them hold various administrative positions both inside and outside the university. Some of their recent achievements are as follows and we would like to acknowledge the exceptional work of our colleagues.

We take pride in congratulating Dr. Pubudu Jayasena, a Senior Lecturer at the Faculty of Computing, SUSL, in her new position as a Research Fellow at the Faculty of Computer Science, TU Dresden, Germany. She joined a research team working on the European Project "AI-Sprint" under the guidance of Professor Fetzer, Christof, and the Chair of Systems Engineering at the Institute of Systems Architecture in the Faculty of Computer Science at TU Dresden, Germany. The EU-funded initiative called AI-Sprint is devoted to the use of edge computing and artificial intelligence in the healthcare and agriculture 4.0 industries.



SOCIAL COMMERCE: EFFECTIVE TOOL FOR ENHANCING THE COMPETITIVENESS OF SMALL AND MEDIUM ENTERPRISES (SMEs)

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The writer is a Lecturer in Business Management, Faculty of Business, Sri Lanka Institute of Information Technology (SLIIT). His research interests includes Entrepreneurship, SMEs, Social Commerce, Social Media and Social Entrepreneurship.

One hour shopping event on TikTok brings in more than a week's worth of sales at a flagship store. Interactive, shoppable live streams in Facebook, Instagram gains more than hundred thousand of likes and comments whereas augmented-reality (AR) lenses in Snapchat helps users "try on" makeup images. All commerce activities in social media are referred as social commerce which enable consumers explore products and carry out transactions through social media and content creation platforms. This new emerging form online commerce has facilitated removal friction from the buying process, creates a more engaging journey for the consumer, and presents new opportunities for brands to generate consumer interest. Figure 01 shows the difference components of social commerce system.

Social media usage has been rapidly increasing in Sri Lanka over the past few years, with the country having one of the highest rates of social media penetration in South Asia.

Figure 1: *Building Blocks of Social Commerce (Source: course5i)*

According to the datareportal (2022), there are approximately 8.2 million social media users in Sri Lanka, which accounts for 38.1 percent of the population. Overall, social media usage in Sri Lanka continues to grow, with the platforms being used for a wide range of purposes and has now become key platform for Small and Medium Enterprises (SMEs) in channeling its product and services to the market.

Social commerce necessitates the exchange of content generated via real-time responses by users and the creation of consumer communities which facilitate business processes. As a examples, applications in social media are providing SMEs widespread platform for direct interaction with market market, ease of use, low cost, and build in capabilities of demographic targeting., Increasing trend of shifting from traditional stores to social commerce platforms can be observed in figure 02. By engaging with customers through social media, businesses can gain valuable insights about their needs and preferences, and tailor the products and services accordingly. This helps businesses build stronger relationships with their customers and improve customer satisfaction.

Social media has shown its capabilities as an effective tool for building brand awareness and provide level playing field for SMEs irrespective of the size of enterprise. By regularly posting engaging content, businesses can increase their visibility and establish themselves as industry leaders that helps businesses stand out from their competitors and improve the competitiveness.

Figure 2: *Purchasing Behavior: In-store Vs Social Commerce (Source: Bazaarvoice)*

In today's digital world, social media platforms increasingly becoming essential element of marketing-related operations because the inexpensive nature, user friendliness and ability to operate with minimum level of techno skills; enabling SMEs to develop competitive edge against large enterprises rivals. Social commerce platforms are also providing customers with a convenient and seamless shopping experience in virtually. By offering a range of payment options and integrating with delivery services to offer customers a hassle-free shopping experience which leads to improve customer loyalty and retention.

Other key aspect of social commerce is greater data insights to businesses on customer behavior and preferences enabling SMEs to get valuable insights into their customers and use this information to optimize their marketing, offerings, and sales strategies to stay ahead of the competition. Social commerce also helping SMEs to create more knowledge about their products or services, which will persuade their potential customers and ultimately increase organizational performance and competitiveness.

However, it is important to note that there are also challenges associated with social commerce, such as the need to build a strong online reputation, manage customer expectations, and ensure the security and privacy of customer data. Despite these challenges, the potential benefits of social commerce for SMEs in developing countries make it an increasingly important aspect of their competitiveness

Although there are some challenges in adapting social commerce, specially for small businesses, it is a valuable tool for businesses looking to improve their competitiveness in the marketplace. By leveraging the benefits of social media platforms, businesses can increase their visibility, engage with customers, improve brand loyalty, increase sales, and gain a competitive advantage and succeed in the marketplace.

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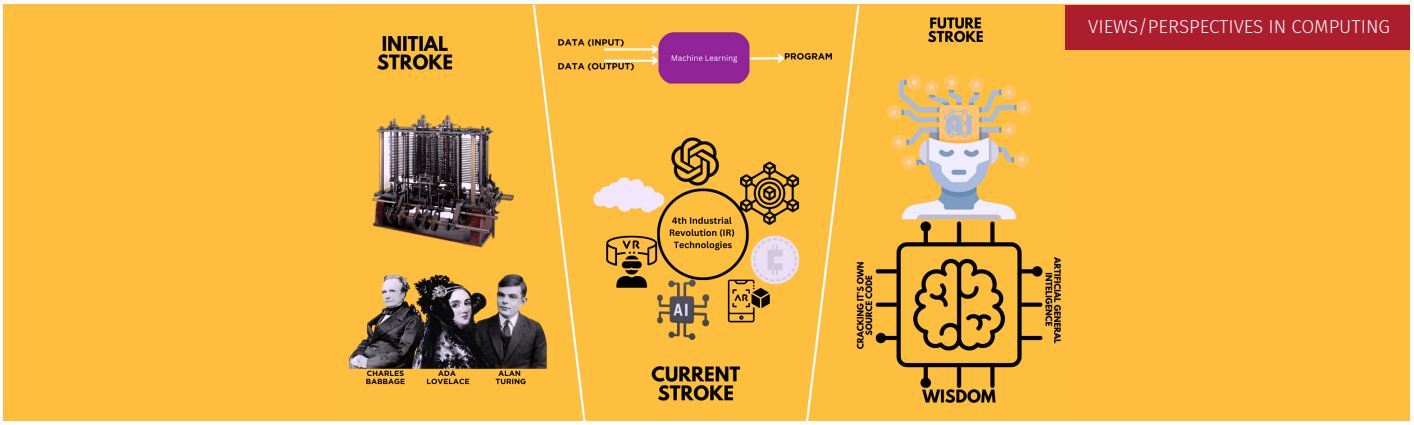
SLASSCOM NATIONAL INGENUITY AWARDS - 2022

The Department of Computing and Information Systems, Faculty of Computing takes pride in congratulating its final year undergraduate Nayanajith Priyasad for being the regional winner in the category 'Best Innovative Product/ Project - University - Sabaragamuwa Province' for the 'Cloud-based Marker-Less Augmented Reality Platform for Mobile Devices (ARMO)' at the SLASSCOM National Ingenuity Awards - 2022.

The contributions of Dr. Pubudu Jayasena, Senior Lecturer, Department of Computing and Information Systems being the supervisor and Mr. Binoj Ishara Batuwanthudawa, Unity Developer at LiveRoom/ Alumnus - CIS being the mentor of the project are gratefully acknowledged in realizing this achievement.

The event which was hosted by the Sri Lanka Association of Software Services Companies (SLASSCOM) with the aim of recognizing and celebrating innovation in the IT/BPM sector of the country was held at Shangri-La Hotel, Colombo on 1st July, 2022.



MASTERSTROKES IN COMPUTER SCIENCE AND ITS PRACTICES

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The writer is a 4th year undergraduate belonging to the Department of Computing and Information Systems, Faculty of Computing, Sabaragamuwa University of Sri Lanka.

The writer is a Lecturer (Probationary) in Computer Science attached to the Department of Computing and Information Systems, Faculty of Computing. His research interests include Data Mining, Social Media Mining, Knowledge Management, and Ontology Modeling.

The world we live in today is deeply connected to computing technology, and this didn't happen overnight. It has been the result of many inventions and masterstrokes that have changed the course of history. The masterstroke is a term used to describe a highly skillful or effective action that introduces a new perspective on old practices, often by replacing existing traditional systems with a new piece.

The Initial Stroke: From Analytical Engines to Decision Problems

Charles Babbage, known as the Father of the Computer, developed the analytical engine and collaborated with Ada Lovelace, the first programmer, to write his name in history. Although we no longer use his form of the computer, his inventions were an essential initial stroke that opened an opportunity for everyone in the field of computing.

The evolution of computers met a significant breakthrough during World War II, which was not only a breakthrough but also a masterstroke in computing. The decision problem was a significant issue at that time, and it was addressed as the Entscheidungsproblem in German, endorsed by mathematician David Hilbert. Solving these problems and similar ones gained fame for Alan Turing, known as the Father of Computer Science. This was the very first masterstroke in the field of computing.

The Trending Stroke: Machine Learning

The 4th industrial revolution accommodated new technologies such as responsive web3, virtualization with AR, VR, MR, decentralized blockchain technologies, advanced neural networks, big data analyzing, sophisticated cloud technologies, the Internet of Things, Robotics, and Automation, among others. However, the entry of the concept of AI changed all perspectives of computing, making a 270-degree shift. The trending masterstroke is now Machine Learn-

ing, which can learn from data and predict patterns/rules, making it a significant breakthrough in the field.

The Future Stroke: Beyond Singularity

As the famous saying by the American stand-up comedian George Carlin goes, "there is no present, just near future." The future of computing is beyond singularity, a term popularized by Vernor Vinge in 1993. The idea of singularity is closely linked to an Intelligence Explosion. A future Artificial General Intelligence that could understand its source code would be a great case, none other than wisdom.

As we are currently in the emerging state of self-driven cars and automated homes, the concept of singularity and advanced humanoid technology may soon become a reality. While these are unimaginable and never be taken as a hypothesis, everything is possible in the cyber civilization

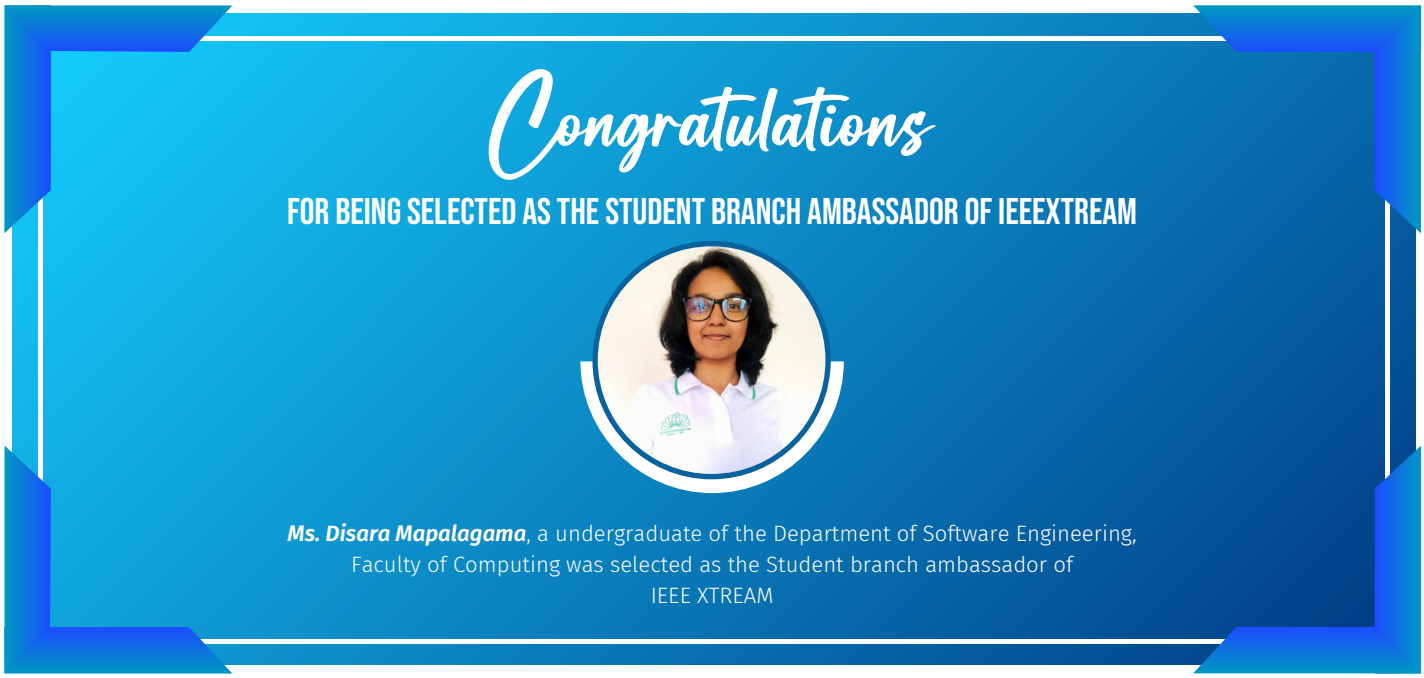
The Next Masterstroke: Industry 5.0

While it's difficult to predict the next masterstroke in computing technology, one paradigm that shows the great potential is Industry 5.0. This new manufacturing paradigm combines the power of human creativity with the latest in automation technology. While Industry 4.0 was focused on maximizing efficiency and reducing costs through automation, Industry 5.0 aims to bring the human element back into the manufacturing process.

Industry 5.0 emphasizes the importance of leveraging the power of human creativity. By working alongside machines and AI, human workers can add value in ways that machines alone cannot. Machines are great at performing repetitive tasks quickly and accurately, but they lack the creativity and adaptability of human workers. Human creativity can lead to innovative ideas and solutions that machines simply can't replicate.

Conclusion

The evolution of computing technology has been a journey of many inventions and masterstrokes that have changed the world we live in today. The future of computing is beyond singularity, and the next masterstroke may be Industry 5.0, which brings human creativity back into the manufacturing process. The potential for technology to work hand in hand with humans is immense, and we are only at the beginning of what is sure to be a thrilling.



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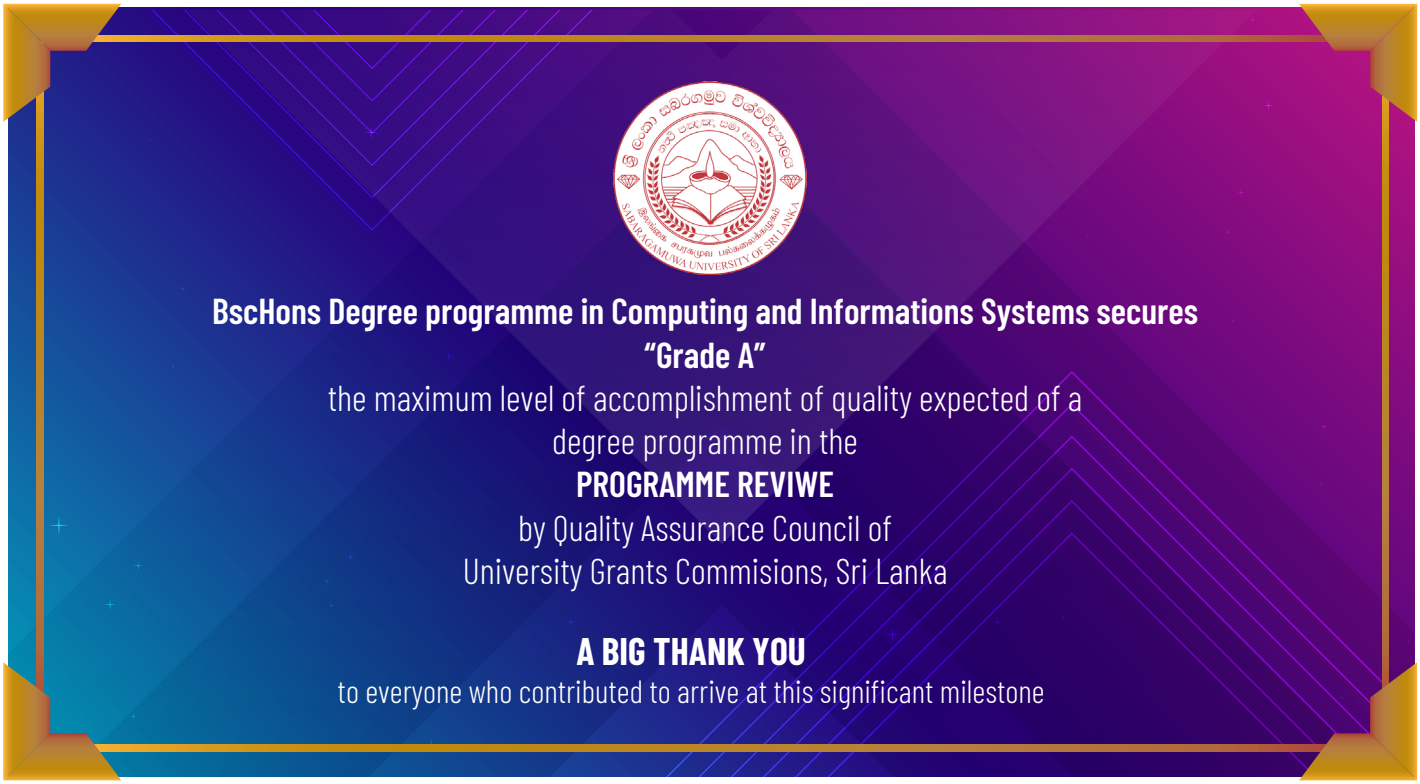
BSc. Hons in Computing and Informations Systems recieved "Grade A" in the programme review by QAC-UGC

It is with great pride and pleasure we announce that the BSc Honours Degree Programme in Computing and Information Systems offered by the Department of Computing and Information Systems, Faculty of Applied Sciences, Sabaragamuwa University of Sri Lanka received Grade "A," - the maximum level of accomplishment and quality expected of a degree programme in the Programme Review conducted by the Quality Assurance Council of the University Grants Commission, Sri Lanka.

Prof. S. Vasanthapriyan, Head of the Department of Computing and Information Systems, Dr. Piumi Ishanka, SER Coordinator (Computing and Information Systems), along with the academic staff members of the Department takes this opportunity to express their sincere gratitude to everyone who contributed in arriving at this significant milestone.

As it grows and expands, the Department continues to look forward to the support and cooperation of all of its stakeholders, in order to maintain the effectiveness of the processes for managing and ensuring the quality of all its degree programmes, student learning experience, and standards of awards in the years to come too.



LET'S USE STREAMLIT IN DATA SCIENCE

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Data scientists and developers may quickly and easily build interactive, responsive web applications and data science dashboards using the open-source Python module Streamlit. Without the requirement for complex web development skills, it offers a user-friendly interface that enables users to create unique web applications that make use of machine learning models, data visualizations, and other data analysis tools.

Figure 1: *Recording moments of supply chain [Image Source: https://www.visiott.com/blog/blockchain-traceability/]*

The founders of Streamlit, Adrien Treuille and Amanda Kelly, initially released it in 2019 with the intention of making the creation of interactive data apps simpler. Python, a well-liked programming language for data science and machine learning, serves as the foundation of the library. Because of its simplicity, adaptability, and capacity for rapid application prototyping and deployment, it has quickly become popular among data scientists and developers.

Streamlit has grown in popularity, because it addresses one of the largest problems in data science, successfully sharing and presenting data findings. Data scientists can use Streamlit to build interactive applications that let users interact with machine learning models and other data analysis tools while also exploring and visualizing data. Communication of ideas and discoveries to stakeholders is facilitated by the ease with which these applications may be shared and implemented.

The ability of Streamlit to quickly prototype and launch applications is one of its main advantages. Data scientists can easily create and refine their applications with Streamlit, facilitating data exploration and visu

alization. Streamlit also allows users to easily share their applications with others, making it easier to collaborate and convey data insights with stakeholders.

Users can easily prototype and develop applications because to Streamlit's user-friendly interface and minimalistic design. With just a few lines of code, users may add elements like sliders, text boxes, and drop-down menus using the single-page interface it offers. Additionally, Streamlit has built-in support for popular data science libraries like NumPy, Pandas, and Matplotlib, which makes it simple to develop original data visualizations and analysis tools.

Users can construct interactive applications fast using Streamlit's integrated components. Users can enter a range of values into the slider component, for instance, which can be used to filter and show data. Users can enter text into the text box component, which can be used to search and filter data. Users can modify the visualizations or data displayed by using the drop-down menu component, which gives them the ability to choose options from a list.

Users of Streamlit are able to design unique components that can be shared and utilized by several applications. With the use of HTML, CSS, - and JavaScript, users may build highly specialized applications that are tailored to their unique requirements. Machine learning models are also supported natively by Streamlit and are simple to include into online apps.

A number of capabilities offered by Streamlit additionally facilitate the deployment and scaling of applications. Applications may be distributed at scale more easily because to Streamlit's ability to be installed on well-known cloud infrastructures like Google Cloud and Amazon Web Services. Moreover, Streamlit supports containerization technologies like Docker, which enables the uniform and dependable packaging and deployment of programs.

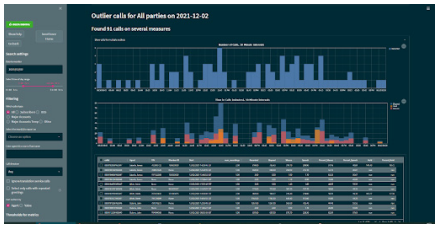

Figure 2: *The usage of Streamlit in a production platform [Image Source: https://blog.streamlit .io/how-delta-dental-uses-streamlit- to-make-lightning-fast-decisions/]]*

There are some other libraries and frameworks that can be used in machine learning and data science projects. Another free Python package called Voila enables users to convert Jupyter notebooks into interactive web applications. A Python framework for creating web apps is called Dash. Users of Dash can build dynamic web apps with a strong emphasis on data visualization. Another Python library for building interactive web apps is called Panel. Streamlit and Dash are comparable to Panel, which has more of an emphasis on customization and versatility.

Ultimately, every one of these web application frameworks offers certain advantages and characteristics of its own. Streamlit excels at quick prototyping and simplicity, Voila excels at sharing Jupyter notebooks, Dash excels at building aesthetically pleasing web applications, and Panel excels at personalization and adaptability. The particular requirements and objectives of the project will determine the framework to be used.

The online community for Streamlit is expanding quickly, and there are many tools and tutorials at your disposal. The Streamlit community makes it simpler for customers to get started with Streamlit by offering a variety of resources and tools, such as example apps and custom components. The documentation for Streamlit is organized and thorough, which makes it simpler for users to understand how to use the library.

STUDENT PROJECTS

Mr. Jayaweerage Ishan Randika is a 3rd year undergraduate at the Department of Computing and Information Systems Faculty of Computing, Sabaragamuwa University of Sri Lanka and completed a Computer Science Diploma under Dip. Computer Science in Edith Cowan University, Australia.

SHARE YOUR RIDES WITH SL RIDESHARE

SL Rideshare is a solution for large fuel consumption and the traffic conjunctions. Therefore, it may be directly affected by the Sri Lankan economy. Not only for Sri Lanka, SL Rideshare will be available for the whole world in the future. We know that on the road there are millions of vehicle rides for millions of destinations everywhere. From this, more than 75% of vehicles drive with empty sheets. SL Rideshare provides an economical value for these empty seats. Drivers are able to find the trustworthy passengers through the SL Rideshare for his empty seats. Users can rate the other drivers and riders, which will be helpful to make the community trustworthy in the SL Rideshare. Because one person is allowed to create only one SL Rideshare account for his/her lifetime, that will be tracked by his/her National Identity Card Number.

This application includes two user roles: the rider and the driver. Sometimes a rider may be a driver and sometimes driver may be a rider, so every SL Rideshare user has both of these privileges. Riders are those who do not own a vehicle, while Drivers are those who do. Through SL Rideshare, a driver can educate the passengers and assist them. A rider may also locate a vehicle that is appropriate for him/her and let the drivers know what the location is. The SL Rideshare app offers the ability to request, accept, and refuse rides in this situation. All of this is accomplished by notification. Simply put, it is similar to adding someone as a friend on Facebook.

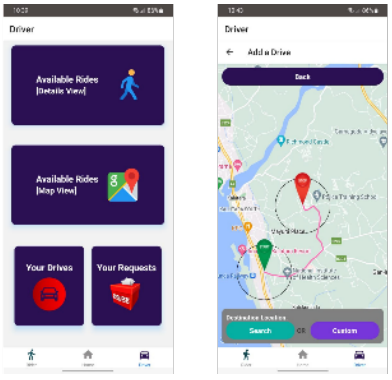

Figure 1: *Screenshots of the SL Rideshare*

The start and destination of all these Rides can be viewed through the Google map. The SL Rideshare app has the ability to save the details of your vehicle as well as the routes to the destination. In order to protect your privacy, you must first create an account on SL Rideshare. Here you can register via your preferred email address or your Google Account. A special feature of SL Rideshare is called Group Manage. Through that you can share your rides only among your trusted ones. If you like, you can join the PUBLIC group where anyone can join. Instead, you can make a group among your friends and share rides.

In the currently available version, users can save their favorite route and vehicles. Then users can use them when they add a drive or a ride. When adding a drive, the driver can use a saved vehicle or a new vehicle. When using a new vehicle, drivers should include every detail about the vehicle because of the security reasons. The user can use the google map to mark the start point of the journey and destination point of the journey when selecting the route.

When adding a ride or drive, the user can input the starting point and destination of his/her journey. Then google maps display the best route for the journey, which is easy for every user to reach their destination easily and find a vehicle for riders.

Users are not allowed to use the SL Rideshare without creating an account. Users can use any email address to create an account as well as users can use their google account to easily create a SL Rideshare account when registering to the SL Rideshare. Users need to give any group ID, or any user can join to the PUBLIC group when they get registered.

Thambippillai Thambiratnam (J.P.U.M) - Attorney at Law Memorial Gold Medal

The Department of Computing and Information Systems, Faculty of Computing takes pride in congratulating Rathnayake Mudiyanselage Dilki Sandunika Rathnayake for winning “Thambippillai Thambiratnam (J.P.U.M) – Attorney at Law Memorial Gold Medal” which is awarded by Prof. S. Vasanthapriyan to the student with the best performance in Computing & Information Systems at the General Convocation of Sabaragamuwa University of Sri Lanka 2022.

SUJCS
Sabaragamuwa University Journal of Computer Science
ISSN 2783-8846

The second volume second issue of the Sabaragamuwa University Journal of Computer Science (SUJCS) is planned to be launched in May 2023

The scope of the Journal includes, but not limited to the following topics:

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ISSN 2773-725X
9 772773 725008