ISSN 2806-531X

IEEENews@UoJ

Newsletter of the IEEE Student Branch, University of Jaffna

Annual Newsletter 2023 - Vol. III

IEEE Computational Intelligence Society
University of Jaffna Student Branch Chapter

Electron Devices Society
IEEE EDS and NTC
Student Branch Chapter
University of Jaffna

IEEE Signal Processing Society
University of Jaffna
Student Branch Chapter

IEEE University of Jaffna IEEE Student Branch
A Student Chapter of the Robotics & Automation Society

IEEE Women in Engineering
University of Jaffna
IEEE Student Branch

IEEE COMPUTER SOCIETY
University of Jaffna Student Branch Chapter

IEEE
University of Jaffna
Student Branch

IEEE PES
Power & Energy Society®
University of Jaffna Student Branch Chapter

IEEE
University of Jaffna
Student Branch

INSIDE THE ISSUE

Cover Story

The IEEE Student Branch of the University of Jaffna (IEEE-SB-UoJ) soared to new heights in 2023, delivering a year filled with impactful events and transformative initiatives. With six active chapters and an affinity group, and over 200 enthusiastic members, the branch showcased its commitment to advancing technology through hands-on workshops, engaging tech talks, and standout events such as the IEEE Summer School on Computational Intelligence and the IEEE Summer School on Emerging Photovoltaic Technologies. These initiatives were supported by competitive grants worth millions of LKR, showcasing the branch's leadership in fostering innovation and collaboration.

By fostering a collaborative environment and embracing innovation, IEEE-SB-UoJ empowered students to tackle emerging challenges in science, technology, and engineering. The branch's vibrant activities and dedication to professional development have left a lasting mark, inspiring the next generation of leaders to dream big and make a meaningful impact in the IEEE community and beyond, earning recognition at both national and regional level for its outstanding contributions.

Awards and Recognition

- **IEEE Regional Exemplary Student Branch Award 2024:** Awarded to the IEEE Student Branch of the University of Jaffna, for outstanding work and impactful contributions from January 1, 2023, to December 31, 2023, recognizing the branch's excellence within Region 10.
- **Emerging Chapter Award:** Presented to the IEEE Computational Intelligence Society Student Branch Chapter of the University of Jaffna, at the IEEE Sri Lanka Section Awards 2023 recognizing its rapid growth under the guidance of Prof. A. Ramanan.
- **Section Outstanding Branch Advisor Award:** Awarded to Dr. M. Thanihaichelvan, advisor of the IEEE Electron Devices Society and Nanotechnology Council Student Branch Chapter of the University of Jaffna, at the IEEE Sri Lanka Section Awards 2023 for his exceptional mentorship and contributions.
- **Section Outstanding Volunteer Award (Student Category):** Received by Mr. Heshan Mallawaarachchi at the IEEE Sri Lanka Section Awards 2023 for his significant contributions to IEEE activities.
- **First Runner-up of Video Contest 2023:** The IEEE Student Branch of the University of Jaffna secured the 2nd place in the competition organised by the IEEE Sri Lanka Section Student Activities Committee.

Grants

The IEEE-SB-UoJ has successfully obtained several competitive grants to execute a range of activities aimed at university and school students. Notably, the branch achieved the following grants:

- **USD 7,500:** Received by the IEEE Electron Devices Society and Nanotechnology Council Student Branch Chapter of the University of Jaffna to host the IEEE Summer School on Emerging Photovoltaic Technologies held on 22-25 July, 2023.
- **USD 3,900:** Received by the IEEE Computational Intelligence Society Student Branch Chapter of the University of Jaffna to organise the IEEE Summer School on Computational Intelligence: Theory and Applications held on 12-14 July, 2023.
- **USD 1,000:** Awarded for enhancing the visibility of the IEEE Electron Devices Society and Nanotechnology Council Student Branch Chapter of the University of Jaffna.

These grants not only reflect the dedication and innovation of the IEEE-SB-UoJ but also provide valuable resources to support its activities.

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The Counsellor IEEE-SB-UoJ

Dr. Kengatharaiyer Sarveswaran
Department of Computer Science,
University of Jaffna.

I am pleased to extend my greetings to all members of the IEEE University of Jaffna Student Branch. As the Student Branch Counsellor, I feel privileged to work with our talented members who consistently show their passion for technology, innovation, outreach, and professional development.

The Student Branch has played an important role in fostering a culture of learning, collaboration, and leadership among students. Through a variety of technical workshops, seminars, competitions, and outreach activities, the branch has provided valuable opportunities for students to enhance their skills, contribute to the wider community, and embrace volunteerism. It is also encouraging to see some of our members making contributions at national and international levels.

I would also like to thank all the authors who contributed articles to this newsletter, making it a valuable issue. My sincere thanks go to Ms. Varsha Jeyarajalingam, the Secretary of the Student Branch, for her dedicated efforts in compiling this newsletter with the support of the team.

I extend my best wishes to all and hope that our students will make the most of this platform to advance their careers.

The Senior Treasurer IEEE-SB-UoJ

Dr. (Mrs.) Barathy Mayurathan
Department of Computer Science,
University of Jaffna.

It is with great pride and immense joy that I extend my warmest congratulations to the IEEE-SB-UoJ on the release of the 3rd volume of its newsletter. This newsletter stands as a testament to the IEEE-SB-UoJ's commitment to knowledge dissemination, professional development, and fostering a strong IEEE community within the university.

The past year has been a remarkable one for the IEEE-SB-UoJ, with significant achievements and well-deserved recognition. Being honored with the IEEE Regional Exemplary Student Branch Award 2024 (1st Jan-31st Dec 2023) is a reflection of the dedication, passion, and unwavering efforts of our student members and mentors. Additionally, the outstanding accomplishments at the IEEE Sri Lanka Section Awards 2023, including the Emerging Chapter Award for the IEEE-CIS-SBC-UoJ, the Section Outstanding Advisor Award to Dr. M. Thanihaichelvan, the Section Outstanding Volunteer Award (Student category) to Mr. Heshan Mallawaarachchi, and the 1st Runner-up position in the Video Contest 2023, showcase the excellence and hard work of our IEEE community.

Beyond accolades, the branch has also demonstrated remarkable initiative in securing competitive grants, amounting USD 12,400 in funding. These grants have enabled the execution of impactful programs, such as the IEEE Summer School on Emerging Photovoltaic Technologies and the IEEE Summer School on Computational Intelligence.

As the Senior Treasurer, I am very proud of the achievements. I extend my heartfelt appreciation to all contributors of this newsletter and wish continued success for the upcoming editions and initiatives of the IEEE Student Branch.

The Chairperson IEEE SL Section

Prof. Buddhika Jayasekara
Chairperson,
IEEE Sri Lanka Section (2023/2024).

It is with great pleasure that I extend my warmest greetings to the IEEE Student Branch of the University of Jaffna as you publish your annual newsletter for 2023. IEEE, as the world's largest technical professional organization, is dedicated to advancing technology for the benefit of humanity. Our mission is to foster innovation, enable professional growth, and provide a platform for students and professionals to collaborate in shaping the future.

As students, you are at the core of IEEE's vision. IEEE membership opens doors to invaluable resources, including access to cutting-edge research, industry-leading conferences, technical communities, and mentorship programs. The Student Branch is an ideal platform to enhance your technical and leadership skills, network with global professionals, and engage in real-world problem-solving.

The IEEE Sri Lanka Section is committed to empowering students by organizing technical workshops, hackathons, career development programs, and networking events. By actively participating in these initiatives, you enhance your technical expertise, build leadership capabilities, and contribute to innovative solutions addressing local and global challenges. I encourage each of you to maximize your IEEE membership, actively engage in your Student Branch, and leverage the opportunities available. Your journey with IEEE will not only enrich your academic experience but also pave the way for a successful professional career.

Wishing you a fantastic year ahead filled with learning, collaboration, and success!

The Chairperson IEEE-SB-UoJ

Mr. R. P. Raveesha Pathirana
Department of Computer Science,
University of Jaffna.

This year, IEEE-SB-UoJ has reached remarkable milestones, empowering students through innovation, collaboration, and skill development. Beyond academics, our events, workshops, and partnerships have showcased our university's talent at sectional and regional levels, bringing recognition to our institution.
These achievements were made possible by the unwavering support of our counselors, past and present, and the dedication of our student committee. This newsletter highlights our dynamic journey, reflecting the growth and impact of IEEE-SB-UoJ.
Thank you for your support and passion. Let's continue exploring, growing, and innovating. Wishing everyone a successful year ahead.

Happy volunteering!

Secretary and Editorial Team Lead IEEE-SB-UoJ

Ms. Varsha Jeyarajalingam
Department of Computer Science,
University of Jaffna.

As I reflect on my journey as the Secretary and Editorial Team Lead of the IEEE Student Branch of the University of Jaffna, I am filled with immense gratitude and a sense of accomplishment. Serving in this position during my first year at the university was both challenging and rewarding. Entering a completely new setting, I was able to draw on the experience I gained from completing and releasing the previous newsletter, which provided me with the confidence and skills to compile this edition successfully.

I would like to express my heartfelt thanks to the previous Executive Committee's Counsellor, Prof. M. Siyamalan, Senior Treasurer, Prof. A. Ramanan, Chairperson, Mr. T. Dilendra, and Secretary, Ms. K. Pavithra, for entrusting me with this role. A special thanks to Prof. A. Ramanan, whose support and guidance during the previous newsletter's compilation helped me learn not only about editorial work but also about the structure and operations of the IEEE organization. I am also incredibly grateful to Ms. Pavithra for her mentorship, which ensured a smooth transition into my responsibilities as Secretary.

This term, I am deeply appreciative of our Counsellor, Dr. K. Sarveswaran, and Senior Treasurer, Dr. (Mrs.) B. Mayurathan, for their invaluable guidance and unwavering support throughout the year. My heartfelt thanks go out to the entire Executive Committee for their encouragement, which made my tasks much easier. A special mention to Ms. M. Sankavi, Awards and Recognition Team Lead, and Mr. R. N. Viththagan, Publicity Team Lead, for their tireless efforts in enhancing the visibility and recognition of our student branch.

Finally, a huge thank you to Mr. N. Thileepan for his collaboration and creative input, which brought this newsletter to life with a visually captivating design. I would also like to thank Ms. Ashna Cynthia for designing the front page and promptly delivering it upon request. It has been an honour to work with such a dedicated and talented team. I hope this newsletter reflects the passion and hard work of everyone involved, and I look forward to seeing our branch reach even greater heights.

IEEE Student Branch - University of Jaffna

Introduction

The IEEE Student Branch of the University of Jaffna (IEEE-SB-UoJ) was established on 27th September 2018 by the Department of Computer Science, marking a significant milestone in enhancing the educational and professional development of students in technology and engineering. As part of the world's largest technical professional organization, IEEE, the branch fosters a vibrant community that promotes learning, innovation, and collaboration among students interested in Computer Science, Computer Engineering, Information and Communication Technology, Electrical, and Electronics disciplines. Through a diverse range of activities, including workshops, seminars, and networking events, the IEEE-SB-UoJ serves as a vital platform for aspiring engineers to engage with cutting-edge technologies and industry practices, contributing to their growth as future leaders in technology and engineering.

Under the umbrella of the student branch, there are six chapters and one affinity group, each offering unique opportunities for engagement. The IEEE-SB-UoJ, along with two chapters and the affinity group, is primarily administered by the Department of Computer Science. Additionally, one chapter is managed by the Department of Physics, and the remaining three chapters are under the Faculty of Engineering. This structure enables the branch to integrate expertise from multiple disciplines, creating a collaborative environment that nurtures innovation and interdisciplinary learning. Our commitment to excellence is reflected in our achievements, with awards and grants earned at national, regional, and global levels, demonstrating our impact within the IEEE community.

Vision

Become a remarkable student branch dedicated to empower technological leaders by encouraging and facilitating students to attain highest achievements by developing their skills.

Mission

Foster technological innovation and excellence for the benefit of humanity and promote the theory as well as the practice of all aspects of Computer Science, Computer Engineering, Information Communication Technology, Electrical and Electronics Engineering.

PES Chapter IEEE-SB-UoJ

The Advisor
Prof. A. Atputharajah
Department of Electrical & Electronic Engineering,
University of Jaffna.

During my tenure as the Advisor of IEEE-PES-SBC-UoJ, we successfully organised nine impactful events, including the website launch and Day 4 of the IEEE Summer School on Emerging Photovoltaic Technologies. These initiatives have provided valuable learning experiences, fostering innovation and collaboration among our members.

Being part of IEEE opens doors to global networking, exclusive resources, funding opportunities, and professional growth. I encourage students to take advantage of these benefits, enhance their skills, and contribute to technological advancements.

Annual General Meeting 2023

The Annual General Meeting (AGM) of the IEEE Power and Energy Society Student Branch Chapter of the University of Jaffna for the election of the new Executive Committee was held on the 27th of May 2023, from 6 PM to 7 PM via Zoom, with 30 attendees. The AGM commenced with Mr. Akitha Anupriya, the outgoing Vice Chairperson, welcoming all attendees. Key events included the presentation and approval of the previous meeting minutes by Mr. Thisal Fernando, the election of new committee members, and an inspiring address by the advisor of the society, Prof. A. Atputharaja. The newly elected Chairperson, Mr. Charaka Viduranga, and other office bearers were announced, followed by a vote of thanks from the new President. The meeting successfully facilitated the election of the new committee and provided a platform for insightful discussions and guidance, concluding on a positive note for the Chapter's activities in the forthcoming year.

The Chairperson
Mr. Charaka Viduranga
Department of Electrical & Electronic Engineering,
University of Jaffna.

As we gather here today, reflecting on the remarkable journey we have embarked on together, I am filled with immense gratitude and pride. Before we delve into our achievements and the profound impact we have had, I want to extend my deepest appreciation to everyone who has played a pivotal role in our success.

First, I want to express my gratitude to the Dean of the Faculty, Dr. K. Pirabaharan, and our former Head of Department, Prof. A. Ahilan, for their unwavering support and guidance. A special mention goes to our members, volunteers, and sponsors. We also extend our heartfelt appreciation to the IEEE Student Branch of the University of Jaffna for their continuous support and collaboration, especially to our esteemed advisor, Professor A. Athputharajah, whose mentorship has been invaluable in shaping our journey.

During my tenure, we have achieved a significant milestone by organising a record-breaking ten events, including one national event, website launching, two hands-on sessions, one day of a summer school, two membership development events, and two workshops. This remarkable feat not only underscores our dedication to academic and professional enrichment but also positions us as pioneers within our faculty.

The impact of these events on our members and the wider community is significant and cannot be overstated. IEEE PES Student Branch Chapter of the University of Jaffna has emerged as a hub of learning, fostering professional skills and leadership qualities among our members. Through our initiatives, we have not only enriched our academic pursuits but also ignited a spark of ambition to elevate our university's reputation nationally and globally.

Our collaborations with esteemed organisations such as the IESL Vadakkin Chapter, IEEE EDS and NTC Student Branch Chapter of the University of Jaffna, IEEE Robotic and Automation Student Branch Chapter of the University of Jaffna, IESL Student Chapter University of Jaffna, and IET On Campus University of Jaffna have further amplified our impact and extended our outreach.

Today, we stand as a premier society within both our University and the IEEE Power and Energy Society Chapter of IEEE Sri Lanka Section. This accomplishment is a testament to the dedication and satisfaction of our members. Balancing our commitments to the society alongside academics and other responsibilities hasn't been easy, but through proper planning and effective time management, we have overcome every obstacle.

As I hand over the reins to the incoming leadership team, I urge you to carry forward this momentum and uphold our commitment to excellence. With dedication and meticulous planning, you have the power to lead the society to even greater heights of success and impact.

Thank you all for your unwavering support and dedication. Together, let us continue to inspire, innovate, and make a positive impact on our university, our community, and the world.

EVENTS

Workshop on "PSCAD"

The IEEE PES Student Branch Chapter of the University of Jaffna conducted a successful PSCAD Workshop, on 26th of May 2023, from 3:30 PM to 5:30 PM at the Simulation Laboratory, Department of Electrical & Electronic Engineering, Faculty of Engineering, University of Jaffna. The workshop, attended by 25 participants, mainly from 3rd year and final year, was led by Prof. A. Atputharajah, a Senior Professor in the Department of Electrical & Electronic Engineering, UoJ. The session aimed to provide preliminary knowledge on using PSCAD, a powerful tool for power systems analysis. Participants were given hands-on experience with PSCAD-installed PCs, modelling a simple power system under Prof. Atputharajah's guidance. The interactive session also covered features of PSCAD, with examples on synchronous machines, HVDC, and active series filters.

Hands-on session on "Solar Panel Skill Development"

A hands-on session on Solar Panel Skill Development was organised on 25th of June 2023, from 8:30 AM at the Department of Electrical and Electronic Engineering, Faculty of Engineering, University of Jaffna. The workshop, facilitated by Mr. Padmadewa Samaranayake, Project Coordinator Officer at the Sri Lankan Sustainable Energy Authority, saw the participation of around 50 individuals. The comprehensive agenda covered topics such as site assessment, measurement of PV module parameters, installation techniques, testing and commissioning procedures, and practical training in handling tools and testing equipment with a focus on best practices, safety measures, and operations and maintenance checks. This event significantly enhanced the technical expertise of attendees in solar panel systems, contributing to the development of skilled professionals in renewable energy technologies.

Day 4 of the IEEE Summer School on Emerging Photovoltaic Technologies

The fourth day of the IEEE Summer School on Emerging Photovoltaic Technologies, organised by the IEEE PES Student Branch Chapter in collaboration with the IEEE EDS/NTC Student Branch Chapter of the University of Jaffna, took place on 25th of July 2023, from 8 AM to 4 PM, at the Faculty of Engineering, University of Jaffna. Around 90 students participated in the event, which included a field visit to the Renewable Energy Hub at the Kilinochchi Campus of the University of Jaffna. The hub houses Sri Lanka's first floating solar panel, providing participants with a real-world application of photovoltaic (PV) technology. Attendees learned about the design, construction, and operation of the floating solar panel and had the opportunity to meet the engineers and researchers responsible for developing the hub.

The day featured two keynote sessions. Eng. Ranjith Sepala, Chairperson of the Sustainable Energy Authority, Sri Lanka, delivered an illuminating address on the imperative shift towards sustainable energy solutions, highlighting the need to combat climate change and the depletion of fossil fuel resources. Eng. Selvarajah Prabaharan, Deputy General Manager of the Ceylon Electricity Board, Northern Province, Sri Lanka, shared insights into the dynamic world of energy, focusing on challenges and innovative solutions in the sector. The event also included practical demonstrations on solar fitting, site visits to renewable energy projects such as a rooftop solar PV pilot project, a grid-connected wind turbine, a solar measuring centre, a solar floating pilot plant, a biogas pilot project, and the Palai Wind Farm. These activities emphasised hands-on learning and showcased the potential of renewable energy technologies in transforming the energy landscape.

Talk on "Introduction to IEEE PES SB Chapter"

The "Introduction to IEEE PES SB Chapter" event took place on 3rd of October 2023, from 4:30 PM to 6:00 PM at the Department of Mechanical Engineering, Faculty of Engineering, University of Jaffna. With 70 participants in attendance, the session aimed to welcome new members, provide an overview of student branch chapter activities, and foster community. Mr. Akitha Anupriya Nawarathna, Treasurer of IEEE-PES-SBC-UoJ 2023/2024 and a final-year Electrical and Electronic Engineering student at the University of Jaffna, delivered a comprehensive presentation on the significance of IEEE PES, it's mission, and upcoming opportunities. The event featured a networking session and an interactive Q&A, successfully engaging new members and sparking their interest in future chapter activities and initiatives in the IEEE PES Student Branch chapter level.

Launch of IEEE-PES-SBC-UoJ Official Website

The IEEE-PES-SBC-UoJ successfully launched its official website, www.eng.jfn.ac.lk/ieee-pes, on 13th of October 2023, from 03:00 PM to 04:00 PM at the Seminar Building, Faculty of Engineering, University of Jaffna. The event was attended by 12 participants. The launch commenced with a warm introduction, followed by a welcoming speech from Mr. Charaka, the Chairperson of the IEEE-PES-SBC-UoJ. Dr. K. Pirapaharan, the Dean of the Faculty of Engineering, University of Jaffna, shared valuable insights and officially launched the website, emphasising its significance and features. Prof. Athputharaja, the advisor of the IEEE-PES-SBC-UoJ, delivered an inspiring speech on the role of technology in education and research. Mr. Akitha Anupriya Nawarathna, the Treasurer of the IEEE-PES-SBC-UoJ, expressed gratitude in his thank you speech. The event, which showcased the website's user-friendly design and functionalities, concluded successfully, marking a significant milestone for the chapter's online presence. Special thanks were given to Mr. Krishikaran Raveendran from the ICT department for his invaluable assistance.

Webinar on "Smart Grid and Renewable Integration"

Held on the 26th of October 2023 from 4:00 PM to 5:00 PM via Zoom, provided a platform for discussing the pressing challenges and opportunities within the realm of renewable energy. With 145 participants, the session featured Prof. Janaka Bandara Ekanayake, Chair Professor of Electrical and Electronic Engineering at the University of Peradeniya, who shared insights on sustainable energy, barriers, solutions for achieving renewable targets, and system-level solutions like smart grids and virtual power plants. The event fostered a deeper understanding of renewable energy integration, inspiring participants to contribute to a sustainable energy future.

Talk on "Smart Power Flow Controllers - A Necessity for the Future Power Grid"

The IEEE PES Student Branch Chapter, in collaboration with Electrical and Electronic Engineering Society (EEES), of the University of Jaffna, conducted a hybrid mode, technical talk on "Smart Power Flow Controllers - A Necessity for the Future Power Grid" on the 20th of November 2023, from 8:00 AM to 10:00 AM. The session featured, Dr. Kalyan K. Sen, President & CTO of Sen Engineering Solutions, Inc., and an IEEE PES Distinguished Lecturer, who delved into the challenges of traditional power grids, the evolution to smart grids, and the role of intelligent power flow controllers in optimising grid performance. With 50 engineering undergraduates in attendance, the talk covered managing renewable energy integration and showcased real-world applications and advancements.

Talk on "High Power Density Electrical Machines for Electrified Aircraft"

The talk session on "High Power Density Electrical Machines for Electrified Aircraft," organised by the IEEE PES Student Branch Chapter, in collaboration with IESL Vadakkin Chapter of the University of Jaffna, took place on 21st of December 2023, from 2:00 p.m. to 3:30 p.m. Held both in person and via Zoom, the event featured Prof. Kiruba Sivasubramaniam Haran from the University of Illinois Urbana-Champaign, U.S., who joined in-person, as the keynote speaker. Prof. Kiruba Sivasubramaniam Haran, renowned for his work on advanced electrical machines, provided a comprehensive exploration of the advancements in electric machine power density, focusing on hybrid electric aircraft applications. The session, attended by 50 participants, highlighted technological approaches, integration challenges, and the importance of these developments in achieving emission reduction goals in aviation. An engaging Q&A session allowed for discussion, enriching attendees' understanding of the dynamic field of electrical machine engineering.

Workshop on "Solar Panels"

On 8th of January 2024, a workshop on "Solar Panels", was conducted at the Machines Laboratory in the Department of Electrical and Electronic Engineering (EEE), University of Jaffna, with 20 participants. Targeted at E20 students, the workshop ran from 4:00 p.m. to 6:00 p.m. and was led by Prof. Atputharaja, Ms. S. Nithusiga, and Mr. N. Kopisankar. The event featured a theoretical session under the title, "Improvement of Solar PV System Performance in Conjunction with Power Electronics", which focussed on optimising solar PV systems with power electronics, followed by a hands-on session where participants worked directly with solar panels and related equipments. This blend of theory and practice provided a comprehensive learning experience and was met with positive feedback.

IEEE COMPUTER SOCIETY

CS Chapter IEEE-SB-UoJ

The Advisor

Dr. T. Kokul
Department of Computer Science,
University of Jaffna.

As the advisor of the IEEE Computer Society Student Branch Chapter of the University of Jaffna (IEEE-CS-SBC-UoJ), I am delighted to extend my warm greetings to our student branch on the release of this newsletter. In the year 2023, it was an honour for me to witness the incredible strides our branch and CS chapter made in fostering a dynamic and inclusive environment for all members.

The IEEE-CS-SBC-UoJ is one of the active chapters that conducted many tech-talks and webinars in 2023 for the benefit of its members, even during the economic crisis in Sri Lanka. The emerging and essential computing topics, such as prompt engineering, UI/UX design, and game development, are introduced to the student members. I would like to take this opportunity to congratulate the chairman and other members of the IEEE-CS-SBC-UoJ for organizing these useful talks and webinars.

I extend a warm welcome to the new committee of the IEEE-CS-SBC-UoJ and offer my best wishes for their endeavours, encouraging them to pursue innovative ideas in line with the vision of IEEE-CS-SBC-UoJ.

The Chairperson

Mr. Imesh Nuwantha
Department of Computer Science,
University of Jaffna.

Over the past year, our community has thrived through collaboration and dedication. We've organised impactful events, fostered innovation, and strengthened our bonds as tech enthusiasts. As we move forward, let unity, passion, and commitment to excellence guide us.

We have seen incredible growth in our skills and network, thanks to everyone's hard work. Let's continue to support each other, share knowledge, and push the boundaries of what we can achieve. Together, we can overcome any challenge and reach new heights in the tech world. Here's to another successful year ahead!

EVENTS

Talk on "Prompting the Future: An Introduction to ChatGPT and the Art of Prompt Engineering"

The IEEE Computer Society Student Branch Chapter of the University of Jaffna hosted the "Prompting the Future: An Introduction to ChatGPT and the Art of Prompt Engineering" tech-talk on the 13th of June 2023, from 1:00 p.m. to 3:00 p.m., at the Auditorium of the Department of Computer Science, University of Jaffna. The event, attended by 87 undergraduates, featured insightful sessions by Mr. Nisal Mihiranga and Ms. Dilini Imaiarachchi, both of whom joined online. Mr. Nisal Mihiranga, Architect - Data Science and AI at Zone24x7, introduced ChatGPT and generative AI, emphasising responsible use and practical applications. Ms. Dilini Imaiarachchi, Co-Founder and CEO of Contech Global (Pvt) Ltd, focused on the essentials of prompt engineering, equipping attendees with skills to optimise interactions with AI models. The interactive Q&A sessions and the speakers' expertise provided participants with a deeper understanding of these cutting-edge technologies, enhancing their educational and creative pursuits.

Annual General Meeting 2023

The annual general meeting of the IEEE Computer Society Student Branch Chapter of the University of Jaffna (IEEE-CS-SBC-UoJ) was held on January 24, 2023, from 1:00 p.m. to 2:00 p.m. at the Auditorium of the Department of Computer Science, University of Jaffna, to assign committee members for the 2022/2023 term. The event was moderated by Mr. Raveesha, the Chairperson of the IEEE Student Branch of the University of Jaffna. The meeting began with a speech by Mr. Heshan Mallawarachchi, the Chairperson of the IEEE-CS-SBC-UoJ of the executive committee 2021/2022, on last year's progress. Ms. Divya, the Secretary, presented the previous year's meeting minutes. Both Mr. Heshan and Ms. Divya, joined the meeting online. Nominations for office bearers of the executive committee term 2022/2023 followed, resulting in the election. The newly elected Chairperson concluded the meeting with a vote of thanks.

Hands-on session on "UI/UX Designing: A Comprehensive Guide With React Native Implementation"

It was held on 8th of August 2023, from 1:00 pm to 3:00 pm at CSL 3&4, Department of Computer Science, University of Jaffna. Mr. Kalaineethan Thayaparan, a passionate mobile developer with expertise in React Native, who was present in-person, conducted the workshop. Mr. Kalaineethan Thayaparan guided participants through practical exercises, emphasising core principles of UI/UX design within the React Native framework. The hands-on session facilitated interactive learning, allowing participants to refine their skills and gain valuable insights into React Native's capabilities. The workshop concluded with a dynamic Q&A session. With 70 participants actively engaged, the session was a resounding success, equipping attendees with practical skills to enhance their proficiency in UI/UX design.

Talk on "Embarking into Game Development"

This event was held on 19th of December 2023, from 1:00 p.m. to 3:00 p.m. at the Auditorium of the Department of Computer Science, University of Jaffna. Led by Mr. Sivakumar Prasanth, CEO of Techserw Labs (Pvt) Ltd, the session introduced around 40 participants to the world of game development, covering essential topics like game design, tech tools, coding basics, and industry careers. Mr. Prasanth's comprehensive talk, delivered via Zoom, provided valuable insights into the lifecycle of game development. The event concluded with participants gaining a basic understanding of game development, inspired to explore this dynamic field further.

Comprehending Next.js and Its Importance for Contemporary Web Development

Mr. Sanjay Kirupakaran
2022/CSC/066
Department of Computer Science.
University of Jaffna

The open-source framework Next.js expands on the features of React.js and was created by Zeit, which is now Vercel. It presents a set of guidelines and resources to make the creation of React applications with server rendering easier. Next.js allows for server-side rendering (SSR) and static site generation (SSG), in contrast to traditional React applications that are only client-side rendered.

Static Site Generation, in which pages are generated at build time instead of for every request, is another feature supported by Next.js. This produces HTML pages that are pre-rendered and can be quickly cached and served.

With the help of automatic code splitting included in Next.js, the application can load only the code required for the current page. By sending less code to the client, this feature improves web page loading times and makes the application faster and more effective.

Next.js uses a straightforward and user-friendly file-based routing mechanism. Pages are used by developers to organize the structure of their projects; each file in the "pages" directory represents a route. This method simplifies route configuration and improves code organization.

Reasons for Using Next.js:

- Web application performance is greatly enhanced by Next.js, which supports SSR and SSG. Quicker loading times enhance the user experience.
- Web development requires the critical component of search engine optimization. The server-side rendering capabilities of Next.js improve search engine optimization by giving search engines well-structured HTML content.
- Next.js has a thriving and dynamic community. This guarantees continuous support, an abundance of documentation, and a developing ecosystem of extensions and plugins that increase its functionality.

In summary, Next.js has shown itself to be a strong and adaptable framework that increases ReactJS's potential for contemporary web development. Due to its emphasis on performance optimization, SEO-friendly features, and streamlined development process, it is the go-to option for developers who want to create scalable and effective applications. Next.js is proof of the value of frameworks that put developer experience and user satisfaction first as web development continues to advance.

References - https://nextjs.org/docs , https://en.wikipedia.org/wiki/Next.js

IEEE Robotics & Automation Society

RAS Chapter IEEE-SB-UoJ

The Advisor

Mr. N. Pathmapirian
Department of Computer Engineering,
University of Jaffna.

As the Advisor of the IEEE Robotics and Automation Society Student Branch Chapter of the University of Jaffna (IEEE-RAS-SBC-UoJ), I am proud of the chapter's dedication to fostering technological enthusiasm among young minds. One of our key initiatives was the Basic Electronics and Arduino Workshop, held as part of E-Week 2023, which provided hands-on training to school students from Mullaitivu and Kilinochchi, encouraging them to explore the field of robotics and automation.

Although our student office bearers were engaged in internships, limiting the number of events conducted, their commitment to IEEE-RAS remains strong. I encourage students to take full advantage of IEEE's vast resources, workshops, and networking opportunities to enhance their skills and contribute to the ever-evolving world of robotics and automation.

The Chairperson

Mr. M.W.M. Keshan
Department of Computer Engineering,
University of Jaffna.

As the Chairperson of the IEEE Robotics and Automation Society Student Branch Chapter, University of Jaffna, I am pleased to extend a hearty greeting to each reader of the IEEENews@UoJ.

IEEE-RAS-SBC-UoJ was established in June 2021, and we are fortunate to have many active volunteers interested in our field. The IEEE Robotics and Automation Society aims to foster the development and exchange of scientific and technological knowledge in Robotics and Automation, covering both applied and theoretical issues. Robotics involves intelligent machines and systems, while automation includes using automated methods in various applications to improve performance and productivity. Our society strives to advance innovation, education, and research in Robotics and Automation.

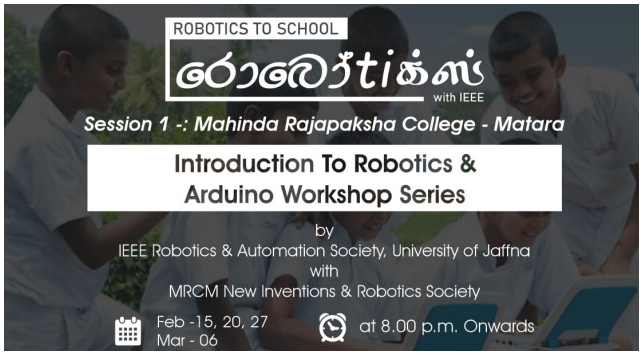
Today, robotics and automation are as popular as Artificial Intelligence (AI). We have successfully conducted several events such as workshops, tutorials, and guest talks, in previous years, and plan to hold many more in the future to enhance the knowledge and skills of the undergraduate students at the University of Jaffna. This includes workshops, tutorials, competitions, webinars, and guest talks. Additionally, we have conducted physical workshops for school students to foster early interest in robotics.

I invite all University of Jaffna students interested in robotics to join us and be a part of this exciting journey.

EVENTS

Workshop on "A Basic Electronics and Arduino"

A Basic Electronics and Arduino Workshop was conducted in the third week of January 2023 at the Faculty of Engineering premises, University of Jaffna, as part of E-Week 2023. The workshop targeted school students from Mullaitivu and Kilinochchi, with participation from over 10 schools. The interactive session provided hands-on training in basic electronics and Arduino programming, inspiring young minds to explore the world of technology. Certificates of participation were awarded to all attendees, marking their enthusiastic involvement in this educational initiative.



WIE Affinity Group IEEE-SB-UoJ

The Advisor

Dr. (Mrs.) Barathy Mayurathan
Department of Computer Science,
University of Jaffna.

It is a great pleasure to extend my heartfelt congratulations to the IEEE Student Branch of the University of Jaffna on successfully releasing the third volume of its newsletter. This initiative continues to serve as a valuable platform for knowledge sharing, fostering awareness, and inspiring students in a wide range of technological domains.

IEEE, as the world's largest technical professional organization, is dedicated to advancing technology for the benefit of humanity. The IEEE Student Branch of the University of Jaffna stands as one of the most vibrant and active branches in Sri Lanka, driven by the dedication, enthusiasm, and commitment of its student members and IEEE senior members. Your collective efforts in promoting technical excellence, professional development, and innovation are truly commendable.

As the Advisor of the IEEE WIE Student Branch Affinity Group, University of Jaffna, I take immense pride in witnessing the growth and impact of this initiative. I extend my best wishes to the editorial team and all contributors for their outstanding efforts in publishing this edition successfully. Best wishes for the continued success of this initiative and future editions!

The Chairperson

Ms. Kokila Madhuwanthi
Department of Computer Science,
University of Jaffna.

As the year 2023 comes to a close, I would like to take a moment to reflect on the activities of the IEEE WIE Student Branch Affinity Group at the University of Jaffna. Despite challenges, our team worked diligently to organize meaningful events that aimed to inspire and empower our members, particularly women in STEM.

This year, we hosted sessions focusing on personal growth, career opportunities, and higher education, which were well-received by participants. These events provided valuable insights and fostered a sense of community among attendees. I extend my gratitude to the speakers, organisers, and participants who contributed to the success of these initiatives.

I am grateful for the dedication and hard work of our team, who ensured the smooth execution of our events. Moving forward, I hope the affinity group continues to grow and create opportunities for learning and collaboration.

Thank you for your support. Wishing you all the best for the future.

EVENTS

Talk on "Strength to Success"

The IEEE WIE Student Branch Affinity Group of the University of Jaffna organised an inspiring online talk titled "Strength to Success", on 10th of July 2023, via Zoom from 6:00 p.m. to 7:40 p.m., with 47 participants in attendance. The session, led by Ms. Abarnah Kirupananda, the Chairperson of the IEEE WIE Sri Lanka Section and a Senior Lecturer at the Informatics Institute of Technology, aimed to motivate undergraduates, particularly women, to harness their strengths and achieve their goals. Ms. K. Abarnah shared her personal experiences as an IT professional, offering valuable insights on overcoming challenges in the STEM field. The event featured an interactive Q&A session and concluded with positive feedback from participants, who appreciated the engaging content and motivational message.

Talk on "Career in Engineering and Studying Abroad"

On the 22nd of July 2023, a virtual tech talk on "Career in Engineering and Studying Abroad," was conducted via Zoom from 9:30 a.m. to 10:50 a.m. The session, which attracted over 55 participants, was led by Ms. Anu Mercian, a Software Engineer at Google with a decade of experience in computer networking. Ms. Anu Mercian shared her journey from India to the U.S., offering insights into career opportunities in engineering, as well as guidance on pursuing higher education abroad, including M.S. and Ph.D. programs. The interactive session allowed participants to ask questions, and the speaker addressed them in a friendly and detailed manner, making the event both informative and engaging.

SPS Chapter IEEE-SB-UoJ

The Advisor

Prof. K. Ahilan ,
Department of Electrical and Electronics Engineering,
University of Jaffna.

As the Advisor of the IEEE Signal Processing Society Student Branch Chapter of the University of Jaffna (IEEE-SPS-SBC-UoJ), I encourage students to actively engage in IEEE and explore the vast opportunities it offers. Signal processing plays a crucial role in cutting-edge technologies, and IEEE-SPS provides access to valuable resources, expert networks, and career-enhancing opportunities. I look forward to seeing our student members take the initiative to organize events, collaborate on projects, and contribute to the growing field of signal processing.

The Chairperson

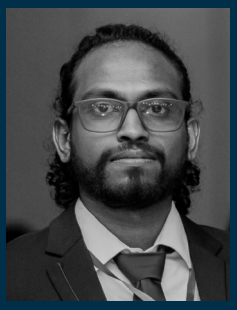
Mr. P. G. I. M. M Marasinghe
Department of Electrical and Electronics Engineering,
University of Jaffna.

It is with great honour and enthusiasm that I extend my greetings to you through the 2023 edition of our IEEE Signal Processing Society Student Branch Chapter section of the newsletter. This year has been a journey of discovery, growth, and achievement for our society at the University of Jaffna.

Our mission is to empower students and professionals by providing a dynamic platform to explore advancements in signal processing and related fields. Guided by our vision of fostering innovation, collaboration, and leadership, we strive to inspire our members to create impactful solutions that address real-world challenges.

As we look ahead, I invite you all to join us in shaping a future where technology serves humanity with precision and purpose. Let us continue to challenge boundaries, nurture creativity, and uphold the ideals that make this society a beacon of excellence.

National/Regional Level Volunteers



Mr. R. P. Raveesha Pathirana
IEEE Sri Lanka Students Activities Committee - Member
Activities Sub Committee
Program Team Member

Ms. Varsha Jeyarajalingam
IEEE Computer Society Sri Lanka Chapter- Student Activities Committee 2023/24 Awards and Recognition Team member
IEEE Day Ambassador 2023 for IEEE-SB-UoJ

Mr. Eranga Kodithuwakku
IEEE Sri Lanka Section Students Activities Committee - Technical Activities Sub Committee
Project Lead (Vice Chair - IEEE Techverse Sri Lanka)

Mr. Isuru Lakmal
Project Lead (Vice Chair - IEEE Techverse Sri Lanka)

IEEE Computational Intelligence Society

CIS Chapter IEEE-SB-UoJ

The Advisor

Prof. A. Ramanan
Department of Computer Science,
University of Jaffna.

As the Advisor of the IEEE Computational Intelligence Society Student Branch Chapter of the University of Jaffna (IEEE-CIS-SBC-UoJ), I am elated to highlight the incredible strides and achievements of 2023. Our successful hosting of the 2023 IEEE Summer School on Computational Intelligence: Theory and Applications from July 12th to 14th at the Department of Computer Science, University of Jaffna, marks a pivotal moment in our journey. The meticulously crafted structure of the summer school, focusing on daily themes encompassing Artificial Intelligence, Machine Learning, Deep Learning, Natural Language Processing, IoT, and Robotics, provided a rich and immersive learning experience. Esteemed scholars from global institutions and esteemed speakers from Sri Lankan universities shared profound insights, complemented by invaluable contributions from IT industry experts, attracting a diverse cohort of students from across Sri Lanka. The resounding success of this inaugural summer school is historic–it marks the first of its kind organised by the University of Jaffna and the pioneering instance of a computational intelligence-focused summer school in Sri Lanka. Our chapter's receipt of a competitive grant from IEEE, securing one of only nine global proposals for hosting IEEE CIS Summer Schools, speaks volumes about our commitment to excellence.

Beyond the summer school, our TechTalks delved into critical topics such as Data Science, Language Comparison, Multimodal Sensor Data Processing, and collaborative sessions on Google Workspace for Education and Dynamics of TechOps with industry partners. Additionally, our efforts in enlightening computing students about good coding practices for competitions have been rewarding. Moreover, receiving the prestigious Best Emerging Chapter Award (Student Branch Category) at the IEEE Sri Lanka Section Awards 2023 stands as a testament to the collective dedication and hard work of the IEEE-CIS-SBC-UoJ and IEEE-SB-UoJ committee members.

My sincere congratulations and profound gratitude go out to all the dedicated executive committee members of the IEEE-CIS-SBC-UoJ, who played a pivotal role in these outstanding accomplishments. Your steadfast dedication and tireless contributions have propelled our chapter to unprecedented success. Here's to another year filled with innovation, growth, and ongoing achievements!

The Chairperson

Mr. Nipun Weerasinghe
Department of Computer Science,
University of Jaffna.

During my tenure as the Chairperson of the IEEE-CIS-SBC-UoJ at the University of Jaffna, I had the privilege of spearheading numerous initiatives, including tech talks, hands-on sessions, and organizing Sri Lanka's first IEEE Summer School. Collaborating closely with department lecturers and IEEE members, I gained invaluable leadership skills that have significantly shaped my professional journey.

A key lesson from my experience is the distinction between a boss and a leader. A boss commands, "Do this," while a leader inspires, "Let's do this together; we can succeed." This approach not only fosters a cohesive team environment but also drives collective success.

As we continue to innovate and tackle new challenges, I encourage everyone to embrace the mindset of a leader. It's not about wielding authority, but about motivating and working alongside your team to achieve common goals.

Introduction

The IEEE Computational Intelligence Society Student Branch Chapter of the University of Jaffna (IEEE-CIS-SBC-UoJ) stands as the sole representative of its kind in Sri Lanka. The society expanded its online presence this year by launching an official website (https://society.jfn.ac.lk/cis), which serves as a centralised hub for updates, activities, and information about ongoing initiatives. The website offers a comprehensive overview of the chapter's mission, upcoming events, and highlights from past activities, ensuring members and visitors stay informed about the latest advancements in computational intelligence. Recognised for its outstanding contributions, the chapter was honoured with the Emerging Chapter Award (Student Branch Category) from the IEEE Sri Lanka Section Awards 2023, which was held on the 4th of November 2023. Additionally, through a competitive grant submitted by Prof. A. Ramanan (the Advisor of the Chapter), the chapter secured USD 3,900 (approximately LKR 1.2 million) to conduct an "IEEE Summer School on Computational Intelligence: Theory and Applications," held from July 12 to 14, 2023, at the Department of Computer Science, University of Jaffna. This marks the inaugural summer school organised by the University of Jaffna and is also the first summer school on computational intelligence conducted by any higher education institution in Sri Lanka.

Annual General Meeting 2023

The Annual General Meeting (AGM) of the IEEE Computational Intelligence Society Student Branch Chapter of the University of Jaffna for the Executive Committee term 2022/2023 convened on January 24, 2023, from 2:00 p.m. to 3:00 p.m. at the Auditorium of the Department of Computer Science, University of Jaffna. The primary agenda was the election of new executive committee members, moderated by Mr. Rumesh Perera. The meeting began with a welcoming address by Mr. Rumesh, followed by the presentation of the previous year's AGM minutes by the former Secretary, Ms. Sobiya Chainee Sivakumar. The election of key executive positions, including Secretary, Chairperson, Vice-Chairperson, Assistant Secretary, Treasurer, and Webmaster, was overseen by Mr. Raveesha, the Chairperson of the IEEE Student Branch of the University of Jaffna, ensuring a smooth transition for the new committee members.

EVENTS

Talk on "Data Science and its Applications"

Held on 31st of January 2023, from 01:30 p.m. to 02:30 p.m., at the Auditorium of the Department of Computer Science, University of Jaffna, the session featured Dr. Alma Rahat, a Senior Lecturer in Data Science from Swansea University, UK, as the keynote speaker, who joined via Zoom. This insightful event provided over 40 participants, with a comprehensive understanding of data science, its significance, and real-world applications across various domains. Dr. Rahat's presentation, blending theoretical concepts with practical case studies, fostered an engaging and interactive session, concluding with a lively Q&A segment.

Talk on "Multi-Modal Sensor Data Processing for Autonomous Vehicles"

Held on 23rd of March 2023, from 02:30 p.m. to 03:30 p.m. at the Auditorium of the Department of Computer Science, University of Jaffna, the talk was delivered by Prof. Thia Kirubarajan from McMaster University, Canada, who joined in-person. With over 30 participants, the event delved into the complexities and advancements in processing multi-modal sensor data for autonomous vehicles. Prof. Thia Kirubarajan's presentation provided a deep understanding of cutting-edge technologies, methodologies and challenges in this field, sparking engaging discussions and knowledge exchange among attendees.

Talk on "Fairness to All While Downsizing"

The TechTalk on "Fairness to All While Downsizing," organised by the IEEE Computational Intelligence Society Student Branch Chapter, in collaboration with the Computer Society of the University of Jaffna, took place on the 10th of February 2023, from 10:00 a.m. to 11:00 a.m. at the Department of Computer Science, University of Jaffna. Dr. Mahendran Velauthapillai, McBride Professor at Georgetown University, Washington, USA, being present in-person, delivered a comprehensive exploration of the challenges and solutions in scheduling multiple jobs on identical machines/channels, with a focus on ensuring fairness during downsizing. The session attracted about 30 participants, who engaged actively in discussions and a vibrant Q&A session. Dr. Velauthapillai's insights, supported by case studies and real-world examples, enhanced participants' understanding of the complexities of downsizing and job scheduling fairness.

Talk on "Building Resources: Language Comparison and Analysis"

Held on 28th of March 2023, from 09:30 a.m. to 10:30 a.m., at the Department of Computer Science, University of Jaffna, the talk was presented by Prof. Miriam Butt from the Department of Linguistics of the University of Konstanz, Germany, who joined in-person. This event provided a comprehensive exploration of the methodologies and challenges involved in comparing and analysing different languages, attracting a diverse audience of over 30 participants. Prof. Miriam Butt's insightful overview illuminated the intricacies of linguistic structures and comparative linguistics.

Talk on "Google Workspace for Education"

The TechTalk on "Google Workspace for Education," held on 26th of June 2023, from 2:00 p.m. to 3:00 p.m. at the Department of Computer Science, University of Jaffna, featured Ms. Shihara Mohamed, Assistant Vice President for SMB Government and Education of Sri Lanka and Maldives. This session provided a comprehensive exploration of Google Workspace's transformative capabilities in education, attracting over 100 participants. Ms. Shihara's presentation covered key features and real-world applications of Google Workspace tools. Also, her team demonstrated live examples and case studies, showcasing the versatility of Google Workspace tools such as Google Classroom, Google Docs, and Google Meet in facilitating collaborative and efficient learning environments. The event concluded with a vibrant Q&A session, enhancing participants' understanding of integrating technology in educational settings.

IEEE Summer School on Computational Intelligence: Theory and Applications

The inaugural 2023 IEEE Summer School on Computational Intelligence: Theory and Applications was successfully hosted by the IEEE Computational Intelligence Society Student Branch Chapter of the University of Jaffna on 12-14 July, 2023. This event, held at the University's Department of Computer Science, marked a significant milestone as the first summer school on computational intelligence in Sri Lanka's higher education landscape.

The program featured a meticulously designed structure with daily thematic focuses. Day 1 provided participants a solid foundational understanding of Artificial Intelligence, Machine Learning, and Deep Learning. Day 2 delved into the nuances of Natural Language Processing, highlighting language's role in intelligent systems. Day 3 illuminated the realms of IoT and Robotics, demonstrating how intelligent systems interact with the physical world. The itinerary balanced theoretical frameworks with hands-on training. Distinguished scholars from global institutions and renowned speakers from Sri Lankan state universities shared insights. Industry experts from 99x, H2O.ai, and SenzAgro Solutions contributed to practical training. The summer school attracted 81 students from diverse Sri Lankan institutions, supported by the University of Jaffna faculty, totaling 104 participants.

Prof. A. Ramanan, Advisor/IEEE-CIS-SBC-UoJ, secured a competitive grant from IEEE for the event, and WSO2's generous support added to its success. For more details visit https://society.jfn.ac.lk/cis/ssci.

Workshop on "Coding Practice for Competitions"

The "Coding Practice for Competitions" workshop held on 22nd of August 2023, from 01:00 p.m. to 03:00 p.m., at the Department of Computer Science, University of Jaffna, provided a dynamic session for over 30 participants, to enhance their coding skills. Led by Dr. E. Y. A. Charles, a Senior Lecturer in Computer Science, at the University of Jaffna, the event focused on practical coding exercises, competition strategies, and algorithmic thinking. The interactive format allowed participants to engage with coding challenges, collaborate, and seek guidance, effectively preparing them for future coding competitions.

Talk on "Dynamics of TechOps in the IT Industry"

The TechTalk on "Dynamics of TechOps in the IT Industry," held on the 29th of August 2023, from 1:00 p.m. to 2:00 p.m. at the Department of Computer Science, University of Jaffna, offered valuable insights into the ever-evolving field of TechOps. This collaborative effort between IEEE-CIS-SBC-UoJ and SyscoLABS featured distinguished speakers Mr. Ishanka Thilakaratne, Senior Manager - Operations; Mr. Roslan Halaldeen, Associate Site Reliability Engineering Lead; and Mr. Dasun Peiris, Senior Site Reliability Engineer from Sysco LABS who joined via online, shared their expertise on the dynamic nature of TechOps, Site Reliability Engineering, and maintaining resilient IT systems. Around 20 participants attended the session. The event successfully connected attendees with industry professionals, providing a comprehensive understanding of the challenges, best practices, and emerging trends in TechOps.

Talk on "Realising Your Potential in Early Stages and Achieving Success"

The IEEE-CIS-SBC-UoJ, in collaboration with Google exploreCSR and the University of Melbourne, hosted a TechTalk on "Realising Your Potential in Early Stages and Achieving Success" on 4th of January 2024, from 03:00 p.m. to 04:00 p.m., at the Auditorium of the Department of Computer Science, University of Jaffna. Featuring Dr. S. Sabesan, Founder and President of PervasID and a Fellow at Girton College, University of Cambridge, who joined us in person, the event aimed to inspire and motivate students by sharing insights on career success and potential realisation. Dr. Sabesan's presentation, enriched with personal anecdotes and strategic advice, highlighted the importance of early career development and the synergy between academia and industry. The event concluded with an interactive Q&A session that left attendees inspired to pursue their professional goals with renewed enthusiasm. Around 60 participants attended this session.

EDS/NTC Chapter IEEE-SB-UoJ

The Advisor

Dr. M. Thanihaichelvan
Department of Physics,
University of Jaffna.

It has been a profound honor to serve as the Advisor of the IEEE-EDS/NTC-SBC-UoJ. Over the past year, our chapter has reached extraordinary heights, and I am happy to share few of our accomplishments with you.

One of our proudest milestones was hosting the "IEEE Summer School on Emerging Photovoltaic Technologies 2023", a flagship event supported by a prestigious US$7,500 grant from the IEEE Electron Devices Society. As one of only three such programs globally, this Summer School offered participants hands-on training in solar cell fabrication, enriching keynote sessions by industry leaders, and a transformative field visit on Day 4 to bridge academic knowledge with real-world applications.

Further elevating our impact, we secured an additional US$1,000 grant to amplify our chapter's visibility, enabling us to expand our outreach and strengthen our presence within the global IEEE community.

The pinnacle of our journey came at the IEEE Sri Lanka Section Awards 2023, where I was humbled to receive the Outstanding Branch Advisor Award. This recognition belongs not to me alone but to every dedicated member of our chapter - your passion, hard work, and innovative spirit have been the driving force behind our success.

I urge you to seize these platforms, forge connections, and continue pushing the boundaries of innovation. Together, let's keep lighting the path toward a brighter, bolder tomorrow.

The Chairperson

Mr. Mathavanayakam Thanushan
Department of Physics,
University of Jaffna.

It is an honor to contribute to the IEEENews@UoJ Vol. III as the Chairperson of the IEEE-EDS/NTC-SBC-UoJ. As one of the vibrant chapters under the IEEE University of Jaffna Branch, our EDS/NTC Chapter has had an exceptional year, marked by innovation, collaboration, and impactful initiatives.

A highlight of 2023 was the successful organization of the IEEE Summer School on Emerging Photovoltaic Technologies (SSEPVT 2023), held from July 22-25. This prestigious event, brought together participants from across Sri Lanka for hands-on training, keynote sessions, and field visits. The event showcased our commitment to advancing renewable energy technologies and provided participants with practical experience in fabricating solar cells, achieving efficiencies of up to 2.96%.

I extend my heartfelt gratitude to our advisor, organizing team, and the IEEE University of Jaffna Student Branch for their unwavering support. Let's continue to inspire, innovate, and lead in the fields of electron devices and nanotechnology.

EVENTS

IEEE Summer School on Emerging Photovoltaic Technologies

The IEEE Summer School on Emerging Photovoltaic Technologies 2023 (SSEPVT 2023) was successfully held from July 22-25, 2023, at the Department of Physics, Faculty of Science and the Faculty of Engineering, University of Jaffna, Jointly organized by the IEEE Electron Devices Society and Nanotechnology Council Student Branch Chapter of the University of Jaffna (IEEE-EDS/NTC-SBC-UoJ), Department of Physics, and the IEEE-PES-SBC-UoJ, the event was one of only three summer schools globally funded by the IEEE Electron Devices Society in 2023. The program attracted 147 applications from state universities across the island, out of which 46 participants, including five graduate students and six industry professionals, were selected for the hands-on lab sessions due to space and safety restrictions. However, 95 attendees joined the invited talks on Day 1, while 110 participants attended the keynote sessions and field visits on Day 4. The event, chaired by Dr. M. Thanihaichelvan (Advisor, IEEE-EDS/NTC-SBC-UoJ), featured contributions from Dr. P. A. Amalraj (University of Jaffna), Prof. G. R. Ashoka Kumara (IFS, Kandy), and Prof. A. Atputharajah (University of Jaffna), who delivered engaging lectures and hands-on training sessions.

The program emphasized theoretical foundations and practical experience, allowing participants to create their own solar cells in a laboratory setting and achieve efficiencies exceeding 1%, with the winning team producing a cell with 2.96% efficiency. Keynote speeches on Day 4 by Eng. S. Prabhakaran (Deputy General Manager, Northern Province, CEB) and Eng. Ranjith Sepala (Chairperson, Sustainable Energy Authority, Sri Lanka) enriched the participants' understanding of renewable energy developments. Field visits included the rooftop and floating solar farms, the biogas plant at Kilinochchi, and the Palai Wind Farm, providing practical exposure to cutting-edge renewable energy technologies. The event was highly appreciated for its well-rounded approach to theoretical and hands-on learning, made possible by the generous financial support from IEEE Electron Devices Society and the dedicated efforts of the organizing team.

To see more, visit:
www.facebook.com/profile.php?id=100094784868609
www.linkedin.com/pulse/ieee-summer-school-2023-dye-sensitized-solar-cell-pasindu-thiwanka

Student Branch Events

Annual General Meeting 2023

The Annual General Meeting (AGM) of the IEEE Student Branch, University of Jaffna, for the Executive Committee term 2022/2023, was held on 10th January 2023, from 1:00 p.m. to 2:00 p.m., at the Auditorium of the Department of Computer Science, University of Jaffna, with over 40 participants in attendance. Moderated by Ms. Nigee Odara Hettige and Ms. Madara Weerasinghe, the meeting included a virtual address by Prof. Pradeep Abeygunawardhana, Chairperson of the IEEE Sri Lanka Section, who commended the outgoing committee's achievements, including the publication of the first newsletter, and encouraged active involvement by the incoming team. Key reports were presented by outgoing committee members: Ms. Pavithra (Secretary), who detailed the 2021/2022 AGM minutes and the annual report, and Ms. Chamodi, who delivered the financial report. Elections for the key executive positions were conducted, appointing Mr. Raveesha Vishwajith as Chairperson, Ms. Varsha Jeyarajalingam as Secretary, Mr. Chamith Chanuka as Vice-Chairperson, Ms. Nigee Odara Hettige as Treasurer, Ms. Apsara Karunarathna as Webmaster, Dr. Kengatharaiyar Sarveswaran as Counsellor, and Dr. (Mrs.) Barathy Mayurathan as Senior Treasurer. The meeting concluded with a vote of thanks from the new Chairperson and a resolution to hold a Special General Meeting to appoint remaining positions and action teams.


Special General Meeting 2023

The Special General Meeting of the IEEE Student Branch of the University of Jaffna convened on 14th February 2023, from 1:15 p.m. to 3:15 p.m., at the Auditorium of the Department of Computer Science, University of Jaffna, with over 50 participants in attendance. Moderated by Mr. Rumesh Perera, the meeting began with a welcome address by the Chairperson, Mr. Raveesha Vishwajith, followed by the unveiling of the second volume of the newsletter "IEEENews@UoJ", presented to Mr. S. Suthakar, Head of the Department of Computer Science, by former Vice-Chairperson Mr. Eranga Kodithuwakku. Key appointments were made to fill the remaining positions in the Executive Committee for 2022/2023, including Mr. Sachintha Nimesh Senevirathna as Assistant Secretary, Team leads and members for, Awards & Recognition, Logistics, Membership Development, Program, Public Visibility, Volunteer Management, Editorial, and Finance teams. The event also featured performances, prize distributions by former Counsellor Prof. Siyamalan and former Senior Treasurer Prof. Ramanan, and a celebratory party commemorating the branch's recent awards at the IEEE Sri Lanka Section Awards 2022. The meeting concluded with a Vote of Thanks by former Chairperson Mr. Dilendra Tenakoon, marking the event's success.




Workshops/Membership Campaigns

JamborIEEE 2022

The JamborIEEE 2022, initiated by the Membership Development Subcommittee of the IEEE Sri Lanka Section Student Activities Committee, was successfully held on 28th January 2023 from 10:30 AM to 7:00 PM at the Kailasapathy Auditorium, DCS Auditorium, and Science Study Hall of the University of Jaffna. The event brought together 170 participants, including 98 students from the University of Jaffna, 70 from the University of Vavuniya, and 2 from Rajarata University of Sri Lanka. Designed to promote IEEE membership, develop soft skills, and foster collaboration, the event featured insightful sessions by distinguished speakers. Keynote speakers included Mr. Lakshan Madushanka, an electrical and electronic engineering professional from the University of Peradeniya, Mr. Heshan Mallawaarachchi, a software engineer at IFS R&D International, and Mr. Dimuthu Anuraj, a research assistant and MPhil candidate in Computer Engineering at the University of Jaffna. These speakers shared their remarkable IEEE experiences, inspiring the participants to explore volunteering and professional development opportunities.

The day-long program also included interactive team-building activities, such as slogan creation and creative logo drawing, as well as fun games like balloon dancing. Participants gained practical insights into IEEE's structure, the benefits of volunteering, and teamwork skills. The event concluded with a DJ session and the announcement of the winning team, Team 08, who were presented with prizes by the organisers. The JamborIEEE 2022 successfully achieved its goals of enhancing membership, networking, and soft skill development among undergraduates from three major universities, fostering a strong sense of community and collaboration within the IEEE Sri Lanka Section.



IEEE STEM Phase-2

The second phase of IEEE STEM, a hands-on workshop aimed at enhancing STEM knowledge among school students from remote areas, was conducted on 1st and 2nd April 2023, from 9:00 AM to 4:00 PM at the Department of Computer Science, University of Jaffna. Organized by Prof. M. Siyamalan and chaired by Mr. Dilendra Tennakoon, this workshop was a continuation of the IEEE Pre-University STEM Portal Grant Programme. A total of 76 school students and 5 teachers from nine schools, including Jaffna Hindu College, St. Patrick's College, and Chundikuli Girls' College, participated in the sessions led by Mr. S. Suthakar, Senior Lecturer at the University of Jaffna, and Mr. T. Kalaineethan, Software Engineer at Ceymplon. The workshop covered Arduino programming, breadboarding techniques, sensor and actuator usage, and serial communication, with students engaging in hands-on coding exercises and practical demonstrations. The event concluded with a competition, where participants showcased their newly acquired skills, and certificates were awarded to both the winners and all attendees, making it a valuable learning experience for the young participants.



Competitive Programming in Python

Was held on 16th October 2023, from 7:00 PM to 9:00 PM, via Zoom, with 25 participants (20 IEEE members). Conducted by Dr. S. Mahesan, Senior Lecturer Gr. I, at the Department of Computer Science, University of Jaffna, the session introduced participants to competitive programming challenges and techniques using Python, focusing on preparing for the IEEEXtreme 17.0 Coding Competition. Dr. Mahesan provided insights into problem-solving strategies, efficient coding practices, handling tricky test cases, and optimizing code for efficiency. Advanced Python programming topics, such as string manipulation, were demonstrated to enhance algorithmic thinking and coding skills. The session concluded with an interactive Q&A segment, followed by a virtual token of appreciation presented to Dr. Mahesan for his invaluable contribution.

JamborIEEE 2023

The JamborIEEE 2023 was held on 16th December 2023, from 9:00 AM to 4:00 PM, at the Faculty of Applied Sciences, University of Vavuniya, with 93 participants from the University of Jaffna and the University of Vavuniya. Organised by the University of Vavuniya and the University of Jaffna, and initiated by Membership Development Subcommittee of the IEEE Sri Lanka Section Student Activities Committee, the event featured inspiring keynote speeches by Mr. Thimeth Perera, Project Engineer at Emerging Media (Pvt) Ltd., and Ms. Michelle Perera, Trainee Project Manager at hSenid Mobile Solutions, focusing on the value of volunteering and personal development through IEEE. Participants engaged in creative team-building activities, including logo design presentations and a paper fancy dress challenge, fostering collaboration and creativity. The event achieved its goal of promoting membership development, enhancing soft skills, and inspiring the next generation of IEEE volunteers. The day concluded with awards, a group photo session, and a vote of thanks by co-chair Mr. Chanuka Ranathunga, marking the success of this engaging and impactful event.





IEEE Day 2023

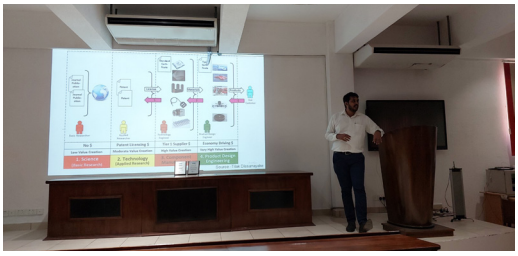
The IEEE Day Celebration 2023 was held on 11th November 2023, from 9:00 AM to 1:15 PM, at the Auditorium, Department of Computer Science, University of Jaffna, with 45 attendees. The event featured keynote talks by Ms. Mrinal Karvir, Senior Cloud Software Engineering Manager at Intel Corporation, USA, on "Practical Approaches to Responsible AI", and Mr. S. P. D. Anuraj, Founding Chairman of IEEE-SB-UoJ, on "IEEE Journey and the Capacity of Humanitarian Works with IEEE". Activities included creative contests like Recreato 2.0, a creative video contest (both contests were organised prior to the celebration day, and the winners were announced on the celebration day), a quiz and games session, and team-building activities. Highlights included a video showcase of IEEE-SB-UoJ's achievements, experience sharing from awards recipients of the IEEE SL Section awards 2023, and a celebration of the branch's community impact. The event concluded with the announcement of contest winners and a vote of thanks by Ms. Varsha Jeyarajalingam, IEEE Day Ambassador and Secretary of the IEEE-SB-UoJ, marking a successful celebration that fostered engagement, membership growth, and community pride.




TECHTALKS

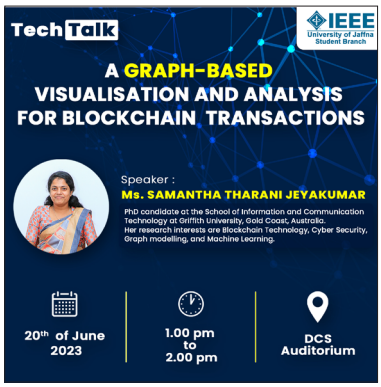
How UBL-Jaffna Can Support You?

The IEEE Student Branch of the University of Jaffna organised a techtalk on "How UBL-Jaffna Can Support You?" on 14th February 2023, from 2:15 PM to 2:45 PM, at the Auditorium of the Department of Computer Science, University of Jaffna, with 70 participants (55 IEEE members) in attendance. Delivered by Mr. Anu Rakavan, Manager of the University Business Linkage (UBL) Cell, the session focused on fostering university-industry linkages, highlighting the role of patents and intellectual property in innovation and economic development. Mr. Anu Rakavan outlined direct support provided by UBL-Jaffna, such as technology enhancements for local firms, e-commerce solutions, and transforming undergraduate research into industry-ready products. He also introduced the Yarl IT Hub's incubator at the Faculty of Science, which supports young entrepreneurs and startups. The event concluded with an interactive Q&A session and a vote of thanks delivered by the IEEE Student Branch Secretary, Ms. Varsha Jeyarajalingam, along with a virtual token of appreciation being awarded for the speaker.



A Graph-Based Visualization for Blockchain Transactions

A tech talk on "A Graph-Based Visualization for Blockchain Transactions" was held on 20th June 2023, from 1:00 PM to 2:00 PM, at the Auditorium of the Department of Computer Science, University of Jaffna, with 56 participants (43 IEEE members) in attendance. Delivered virtually by Ms. Samantha Tharani Jeyakumar, a PhD candidate at Griffith University, Australia, and lecturer at the University of Jaffna (on study leave), the session provided a comprehensive introduction to blockchain technology, focusing on its transaction models and the application of graph-based visualization techniques. Ms. Samantha highlighted the potential of graph-based visualization to analyze blockchain transactions, uncover patterns, and enhance decision-making while addressing its benefits, limitations, and future trends. The talk included real-world use cases, particularly in identifying anomalies in financial crimes. The event concluded with an interactive Q&A session, and a vote of thanks.



Let's Be Secure Online; Red Is the New Blue

The tech talk "Let's Be Secure Online; Red Is the New Blue" was held on 14th November 2023, from 1:00 PM to 3:00 PM, at the Auditorium, Department of Computer Science, University of Jaffna, with 70 participants (25 IEEE members). The session featured Mr. K. Jude Myuran, a Network Security Architect and Lecturer at APIIT, ACBT, and WINSYS, and Dr. K. Maiyuran, Lead Consultant at Virtusa and Lecturer at APIIT, who delivered insightful presentations on the importance of cybersecurity. Mr. Jude explored current trends, threats like the dark web, hacking tools, and practical demonstrations on system vulnerabilities, while Dr. Maiyuran focused on cybersecurity career pathways, certifications, and industry requirements. The event concluded with an interactive Q&A session and a vote of thanks. The session achieved its goals of raising cybersecurity awareness, educating participants on online safety, and guiding future cybersecurity professionals.

Fault Tolerance and Reliability in Cloud Computing

The tech talk "Fault Tolerance and Reliability in Cloud Computing" was held on 20th December 2023, from 1:30 PM to 2:30 PM, at the Auditorium, Department of Computer Science, University of Jaffna, with 77 participants (18 IEEE members). Delivered by Mr. Rajan Bala, Founder of Cubera Investments and former Head of Engineering for AWS Billing Consoles and Applications at Amazon Web Services (AWS), the session explored cloud computing's advantages, disadvantages, and industry-wide adoption. He highlighted key AWS services that contribute to fault tolerance and reliability, discussing mechanisms like redundancy, replication, and load balancing, while addressing challenges such as latency and network failures. The interactive Q&A session engaged participants further, and a vote of thanks by Mr. Raveesha, Chairperson of the IEEE-SB-UoJ, concluded the event.

AWARENESS SESSIONS

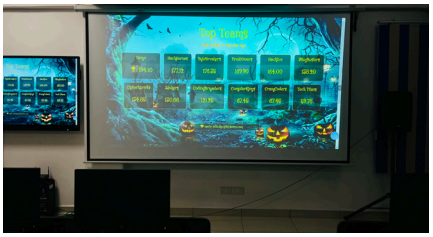
IEEEXtreme 17.0 Awareness Session

The IEEEXtreme 17.0 Awareness Session was held on 26th August 2023, from 7:00 PM to 8:00 PM, via Zoom, with 46 participants (40 IEEE members) in attendance. Moderated by Mr. Thiwanka Chanditha, the session featured Ms. Cybele Ghanem, Global Social Media Team Lead for IEEEXtreme and a Computer and Telecommunication Engineer from the Lebanese University, and Mr. Dimuthu Anuraj, a postgraduate research student specializing in Machine Learning and Signal Processing from the University of Jaffna. The speakers provided a detailed overview of the IEEEXtreme 17.0 24-hour Coding Competition, discussing its purpose, format, rules, team formation, and registration process. They also introduced practice communities and resources to help participants prepare effectively. The event concluded with an interactive Q&A session, offering clarifications and insights, and virtual tokens of appreciation were awarded to the speakers.

CODING COMPETITIONS

IEEEXtreme 17.0

IEEEXtreme 17.0, a 24-hour global programming competition, took place from 5:30 AM on 28th October 2023 to 5:30 AM on 29th October 2023, hosted physically at CSL 3 & 4, Department of Computer Science, University of Jaffna, and virtually for remote participants. Organised by the IEEE Student Branch of the University of Jaffna, the event featured participants from the Department of Computer Science, Faculty of Science and the Faculty of Engineering, supported by event Ambassador of IEEE-SB-UoJ Mr. Isuru Lakmal, organising committee members and proctors. The competition, aimed at fostering teamwork, enhancing coding skills, and increasing IEEE membership, included scheduled breaks for refreshments, networking, and recreational activities like chess and carrom. Participants showcased their problem-solving abilities and enjoyed an engaging environment, combining intense coding sessions with interactive breaks and meals, making the event a resounding success.


Creativity Competitions

Recreato 2.0 Contest

The Recreato 2.0 Contest, organised as part of the IEEE Day 2023 celebrations, challenged participants to recreate the IEEE Day 2023 logo in innovative and creative ways, excluding digital and conventional art forms like pastel and painting. The contest aimed to stimulate divergent thinking by encouraging techniques such as kolam, paper quilling, and cross-stitching. Submissions were evaluated based on creativity, observation skills, and craftsmanship. All participants received e-certificates, and the winner was awarded a cash prize of 1000 LKR.

Creative Video Challenge

Organised as part of the IEEE Day 2023 celebrations, participants were tasked with creating engaging promotional videos for IEEE Day and our IEEE Student Branch using content from its official social media pages. The challenge, open to all UoJ undergraduates, required videos between 30 seconds to 1 minute, adhering to guidelines for originality and non-copyrighted music. Submissions were judged based on creativity, editing skills, and message effectiveness. All participants received e-certificates, and the winner was awarded a cash prize of 1000 LKR.

My Journey with IEEE

A perspective from the IEEE Sri Lanka Section Outstanding Student Volunteer 2023

Mr. Heshan Mallawaarachchi
Software Engineer

In 2019, I embarked on my journey as a dedicated volunteer within the IEEE Sri Lanka Section, starting at the IEEE Student Branch of the University of Jaffna. Over the years, I have proven to be an outstanding leader, achieving remarkable outcomes in various roles.

After serving as Student Branch Editor in 2019, I was selected as the branch's Vice Chairperson in 2020. Together with the Chair and the team, I contributed to guiding and motivating our group to achieve success, leading to several recognitions and awards at the IEEE Boost 2021 Recognition Ceremony. The student branch received the prestigious Best Emerging Student Branch Recognition, reflecting the collective effort behind numerous projects. Additionally, a membership development initiative, led to the branch achieving the second-highest number of IEEE student volunteers across the IEEE Sri Lanka Section, demonstrating the team's dedication to engagement and growth within the section.

In 2022, I assumed the role of Chairperson for the IEEE Computer Society Student Branch Chapter of the University of Jaffna. Under my leadership, the executive committee created a flagship event fostering collaboration between academia and industry, achieving the highest number of CS memberships in the IEEE Sri Lanka Section.

Within the IEEE Sri Lanka Section, I actively participated in various capacities:

- Creative Content Team Member for the IEEE Sri Lanka Section Student, Young Professionals, and Women in Engineering Congress (2020).
- Designer for the IEEE Sri Lanka Section Women in Engineering Affinity Group (2020-2021).
- Co-Designer for the Sri Lanka Power Engineering Conference (SLPEC) organised by the IEEE Power and Energy Society Sri Lanka Chapter (2021).
- Designer for the WIE SYMP, a research conference organised by the IEEE Sri Lanka Section Women in Engineering Affinity Group (2021-2022).
- Team Lead of the Public Visibility Subcommittee in the Student Activities Committee of IEEE Sri Lanka Section (SLSAC) (2021).
- Editorial Committee Member of the IEEE Sri Lanka Section (2021-2022).
- Vice Chair for Public Visibility in the IEEE Sri Lanka Section Student Activities Committee (SLSAC) (2022),

overcoming challenges of coordinating volunteers with diverse expertise and leaving a positive impact during the term.

My engagement with IEEE Region 10 significantly enriched my volunteer path. Initially participating as a Publicity Member for the Sparklers Summit organized by IEEE Region 10 Young Professionals in 2021, I displayed my creativity and dedication, garnering attention that led to my selection for the Career and Leadership Aid Program (CLAP) in both 2021 and 2022. My exceptional work in publicity at CLAP underscored my commitment.

Furthermore, I actively contributed to the IEEE Region 10 Awards Ceremony in 2020 and 2021, coinciding with my involvement in the Sparklers Summit. In 2022, I achieved a milestone by securing my first committee position within IEEE Region 10 as a Graphics Designer and Operational Support Coordinator in the IEEE Region 10 Student Activities Committee. This accomplishment set the stage for my subsequent appointment as the Lead Coordinator for Public Visibility in the IEEE Region 10 Student Activities Committee for 2023. Adding to my portfolio, I served as the Virtual Coordinator for the Student Track of the IEEE Region 10 Student, Young Professionals, Women in Engineering, and Life Member Congress 2022, held in South Korea, further solidifying my presence on the regional stage.

My commitment to knowledge-sharing has been a prominent facet of my volunteer journey. I conducted sessions within the IEEE Sri Lanka Section, imparting my volunteer experiences and design techniques to fellow volunteers. This dedication to sharing insights and expertise contributed to my recognition as one of the final three nominees for the Outstanding Student Volunteer of the IEEE Sri Lanka Section Awards in 2022.

In 2023, my exceptional leadership skills were further recognized with committee positions in IEEE Young Professionals Sri Lanka and IEEE Sri Lanka Section SIGHT.

My acknowledgment as the recipient of the prestigious IEEE Sri Lanka Section Outstanding Volunteer (Student Category) in the 2023 awards underscores the profound impact of my exceptional contributions and accomplishments within the IEEE community. This recognition stands as the highest honor attainable for a student volunteer in their journey within the IEEE Sri Lanka Section. The award serves as a powerful testament to my unparalleled dedication and significant contributions as a student volunteer. It signifies that my active involvement and tireless efforts have not only been acknowledged but also celebrated by the IEEE Sri Lanka Section. This esteemed accolade is a clear affirmation of my unwavering commitment to service, exemplary leadership, and my noteworthy contributions to the advancement of technology within the organization.

Ionovoltaics

Transforming Energy Generation with the Motion of Ions

Dr. Amalraj Peter Amalathas
Department of Physics, University of Jaffna.

Renewable energy sources like solar, wind, and hydropower present a significant challenge while providing substantial environmental advantages. Their energy production is uncertain due to changing environmental conditions. On the other hand, alternative energy harvesting technologies that depend on stimuli, such as piezoelectric and triboelectric effects, face limitations due to their need for artificial pressure and intermittent electrical signals. That's why it's crucial to develop an energy-harvesting device that can continuously produce an electric signal by utilizing an uninterrupted flow of fluids. Ionovoltaics introduces a groundbreaking concept in energy conversion by harnessing water movement and ion dynamics to generate energy. The ionovoltaic phenomenon is based on the idea that energy conversion occurs due to the interaction between the nanoscopic ionic behavior at the solid-liquid interface, stemming from the motion of macroscopic droplets, and the flow of electrons inside a semiconductor electrode.

Although the fundamental principle of water motion-induced energy generation devices is commonly attributed to the interaction between ions and solid surfaces in the electric double layer (EDL), which is mainly formed at the solid-liquid interface, numerous scientific interpretations continue to emerge from different viewpoints. Since the EDL is fundamentally determined by ion and surface properties, the theory of "ionovoltaics" seems to be the most convincing in explaining this phenomenon of electricity generation originating from ion dynamics at the solid-liquid interface. Therefore, the research hypothesis of ionovoltaics was developed by Narozhny and Levchenko to understand how ions at the solid-liquid interface interact with charge carriers in the electrode [1]. Narozhny and Levchenko suggested that the fundamental interaction between ions and charges is mainly influenced by Coulomb interactions, as shown in Figure 1.

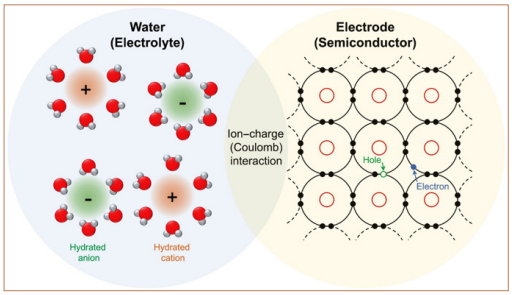


Figure 1: The main idea of ionovoltaics: the interaction between ions and charges occurs through Coulomb interactions when hydrated ions in the water (electrolyte) interact with electrons or holes in the solid electrode (semiconductor) [2].

Junwoo Park et al. theoretically and experimentally demonstrated, for the first time, explaining the electricity generation by moving droplets through ion-electron interactions based on the ionovoltaic principle [3]. It was reported that enhanced energy transducer to convert the mechanical energy of flowing water droplets into continuous electrical energy using an electrolyte-insulator-semiconductor structure as a shown in Figure 2. The success of producing continuous electrical energy from a flowing water droplet marks a significant step forward in ionovoltaic research.

This accomplishment is primarily attributed to the use of a high-resistance semiconductor as a single electrode in ionovoltaic devices, contrasting with the traditional use of two conductors as electrodes. Flowing water droplets go through a continuous process of cation adsorption and desorption. As cations are released from the back of the droplets, electrons escape the confinement of the Coulomb interaction and move to the front. The electrical signal is primarily caused by this flow of charge across a semiconductor electrode as a result of ion absorption or desorption. As a result, the concept of ionovoltaics was first introduced in 2017, marking an important milestone. This discovery has led to the development of a new field of study called ion dynamics-based (ionovoltaic) power generation.

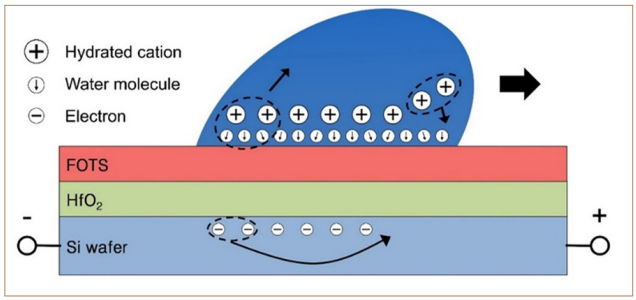


Figure 2: The main idea of ionovoltaics: Schematic diagram of a droplet-flow-induced first development of ionovoltaic device with electrolyte-insulator-semiconductor structure [3].

Through thin-film processing and chemical surface treatment techniques, ionovoltaic devices can tune the characteristics of the solid-liquid interface. This allows for a variety of interfacial phenomena based on ion-surface interactions. These ionovoltaic devices show ion specificity, meaning that different ions with the same charge have distinct characteristics [4]. Ionovoltaic phenomena have been linked to chemical interactions in addition to physical interactions between ions and the interface. Park et al. reported that by modifying the self-assembled monolayer (SAM) of the ionovoltaic device with amine groups capable of protonation, the surface charge can be reversed, leading to a corresponding inversion of the output signal in the ionovoltaic device [5].

In contrast to conventional devices, the ionovoltaic devices produces efficient ionovoltaic output signals by employing a high-resistance electrode to create a voltage drop between the front (ion adsorption) and back (ion desorption) sides of a moving droplet. The electrodes must be in the appropriate resistance range for ionovoltaics to achieve high energy conversion efficiency. The ionovoltaic device, which creatively raises the energy conversion rate to 29.8%, was proposed through the development of semiconductor electrodes in an energy transducer based on ion dynamics. This device continuously generates electrical energy during the movement of water droplets [3]. Based on this, numerous kinds of water motion-induced ionovoltaic devices were examined in order to verify the viability of large-scale, flexible energy generators for real-world uses. These investigations concentrated on enhancing the efficiency of energy generation by adjusting the electrical characteristics of the electrodes, such as carrier concentration and resistance.

The potential applications of ionovoltaics as an analytical tool for different solid-liquid interfacial phenomena and as a biological/chemical sensing platform for the detection of substances in the liquid phase are demonstrated by the basic principles of the technology and material and interfacial engineering approaches [2, 6].

This discovery has introduced a new research field called ion dynamics-based (ionovoltaic) power generation. It sits at the crossroads of understanding the "solid-liquid interface phenomenon" and creating "energy-harvesting devices." This breakthrough has sparked the development of theories in different research areas, exploring self-powered devices using various water movements. It holds significant potential as a promising renewable energy technology in the industrial sector.

References

[1] B. Narozhny and A. Levchenko, "Coulomb drag," Reviews of Modern Physics, vol. 88, no. 2, p. 025003, 2016.

[2] W. H. Lee, J. Park, S. G. Yoon, H. Jin, J. Han, and Y. S. Kim, "Ionovoltaics in energy harvesting and applications: A journey from early development to current state of the art," EcoMat, p. e12408, 2023.

[3] J. Park, S. Song, Y. Yang, S.-H. Kwon, E. Sim, and Y. S. Kim, "Identification of droplet-flow-induced electric energy on electrolyte-insulator-semiconductor structure," Journal of the American Chemical Society, vol. 139, no. 32, pp. 10968-10971, 2017.

[4] Park et al., "Ion specificity on electric energy generated by flowing water droplets," Angewandte Chemie International Edition, vol. 57, no. 8, pp. 2091-2095, 2018.

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[6] H. Jin et al., "Identification of water-infiltration-induced electrical energy generation by ionovoltaic effect in porous CuO nanowire films," Energy & Environmental Science, vol. 13, no. 10, pp. 3432-3438, 2020.

PyWhatKit

Automate WhatsApp with Python

Mr. Pamuda U. de A. Goonatilake
2022/CSC/093

Introduction

There is a Python library called "**pywhatkit 5.4 - Released June 27, 2022**" [1], which is a multi-functional library. This is one of the best powerful WhatsApp automation library. The author of this library is "Mr. Ankit Raj Mahapatra". This library has the following features [1]:

- Sending Message to a WhatsApp Group or Contact
- Sending Image to a WhatsApp Group or Contact
- Converting an Image to ASCII Art
- Converting a String to Handwriting
- Playing YouTube Videos
- Sending Mails with HTML Code

How do we combine it with WhatsApp?

This is a very interesting part of this library. The creator of this library has provided us with many functions to communicate with WhatsApp. Such as,

- **sendwhatmsg_instantly()** - Send WhatsApp Message Instantly.
- **sendwhatmsg()** - Send a WhatsApp Message at a Certain Time.
- **sendwhatmsg_to_group()** - Send WhatsApp Message to a Group at a Certain Time.
- **sendwhatmsg_to_group_instantly()** - Send WhatsApp Message to a Group Instantly.
- **sendwhats_image()** - Send Image to a WhatsApp Contact or Group at a Certain Time.

From the following example, you can get a clear idea about that.

Let's think, you want to send a message to someone according to a pre-scheduled time. So we need to call the "sendwhatmsg()" function, and we need to provide the following parameters to the function [2].

- **phone_num**(required) - Phone number of target with country code.
- **message**(required) - Message that you want to send WhatsApp message.
- **time_hour**(required) - Hours at which you want to send message in 24 hour format.
- **time_min**(required) - Minutes at which you want to send message
- **wait_time**(optional, val=20) - delay the executing process(loading the WhatsApp chat)
- **print_waitTime**(optional, val=True) - Will print the remaining time if set to true

Then, after run the program,

1. First, wait until the scheduled time arrives.
2. After that, it automatically open the web browser and load the WhatsApp web.
3. Auto-direct to the receiver chat and load the message.
4. The program waits for the "wait_time" and automatically presses the "enter" button on the keyboard.
5. Finally, close the tab automatically.

To get a clear idea about the program, see the (figure 1)

```
    """Send a WhatsApp Message at a Certain Time"""

    if not core.check_number(number=phone_no):
        raise exceptions.CountryCodeException("Country Code Missing in Phone Number!")

    if time_hour not in range(25) or time_min not in range(60):
        raise Warning("Invalid Time Format!")

    current_time = time.localtime()
    left_time = datetime.strptime(
        f"{time_hour}:{time_min}:0", "%H:%M:%S"
    ) - datetime.strptime(
        f"{current_time.tm_hour}:{current_time.tm_min}:{current_time.tm_sec}",
        "%H:%M:%S",
    )
    if left_time.seconds < wait_time:
        raise exceptions.CallTimeException(
            "Call Time must be Greater than Wait Time as WhatsApp Web takes some Time to Load!"
        )
```

figure 1: Source code of the scheduled message sending function

What are the benefits of using "PyWhatKit"?

We can,

- send scheduled WhatsApp messages autonomously (e.g., scheduled birthday wishes),
- send a bulk of different messages to different receivers,
- play YouTube videos directly,
- automate Google searches and access the results directly.

Summary

PyWhatKit is a powerful tool that makes it easy to automate tasks on WhatsApp using Python. It lets you send messages, share content, and more, all without lifting a finger. This makes it a great way to save time and effort and opens up new possibilities for creative and automated interactions.

References:

https://pypi.org/project/pywhatkit/
https://pypi.org/project/pywhatkit/4.6/

Navigating the Social Media Landscape

A Guide to Ensuring Your Online Security

Mr. Bhagya Sandakelum
2022/CSC/030

Social Media is the main space for people to interact with other people with a high-intent lifestyle. A lot of people have no time to interactct with people physically so they use various social media networks to reach their relatives. Another use of social media is upatade with news and information. So basically we can't live without social media.

The increase of social media usage, Users should focus their online safety, But that is what most people forget. Just as we care about our safety in real life, or even more so, we should think about our safety in social networks. In this, we focus how being safe in social media.

It's important to note that the security landscape for social media companies is averagely good, and these platforms continually update their security measures in response to emerging threats. Users play a crucial role in their own security by staying informed about platform features, regularly reviewing and adjusting privacy settings, and being vigilant against phishing and other online threats. Additionally, regulatory bodies are increasingly focusing on holding social media companies accountable for data protection and user privacy.

There are some common threats informed daily on social media.

1. **Phishing Attacks -** This is a common threat. Here, someone sends emails or messages attempting to get passwords or any other sensitive data. This is done very quietly, and the user is given reasons why they are supposedly unable to provide the data in that instance.
2. **Scam -** This is accomplished by creating the impression that the scammer is wealthy or something similar, then placing your page under one of their business managers and locking you out. Once the page has been added to a business manager, the owner of that manager account gains admin privileges and can perform anything within the page. This is known as taking control of the page.
3. **Hijacking -** This process involves placing an extension, crack, or setup file somewhere on your computer, which allows cookies to be uploaded into your browser covertly. This results in someone assuming your identity and signing in as you.

These are the most popular social media threats. However, more social media threats are spreading online, such as Social Engineering, Identity Theft, Location-based Threats, Unauthorized Data Collection, Fake Profiles and Impersonation, Inadequate Privacy Settings, and Data Breaches, among many others. I would like to invite you to search for these topics on the internet and stay informed to secure your online safety.

While social media companies secure their users' accounts on their platforms, you also have a responsibility to secure your accounts. To secure your social media you can do these things.

1. **Create Strong and Unique Passwords -** A password is the key to your account. If your password is leaked, hijacked, or hacked, you lose your safety on social media. So, you should use a strong password. Another important thing is: don't use the same password across different social media accounts.

   Your password should be unique, and you should avoid using your name, birth year, or town as your password.

   Example:
   abc1234 - Weak Password
   gHDJD|nnsociHJ@2453<>SK - Strong Password

   If you forget your password, use a reputable password manager such as Bitwarden.

2. **Enable Two-Factor Authentication (2FA)** - In addition to the standard username and password combination, Two-Factor Authentication (2FA) adds an additional layer of verification to improve the security of online accounts. Even if an attacker is able to get their hands on the user's login credentials, the main objective of 2FA is to lower the likelihood of unauthorised access. All social media platforms provide 2FA option. You can find 2FA option accounts security section.

3. **Customize Privacy Settings** - As we previously discussed social media platforms gives updated security options to secure your account. As a user you should check that privacy settings and you adjust it to as fit your social media behavior.

4. **Review App Permissions -** When a social media app is installed on your device, it requests various permissions. To keep your privacy secure, you should pay attention to what permissions you are granting to the application.

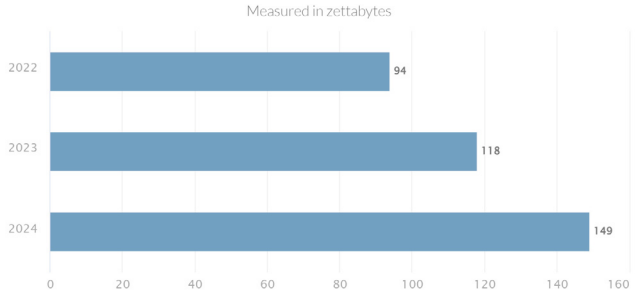
Certainly! Social media platforms, while offering numerous benefits, also pose various security threats. It's essential for users to be aware of these threats to protect their personal information and maintain a secure online presence.

Big Data Decoded

Understanding the Characteristics, Benefits, and Concepts of Big Data

Ms. Varsha Jeyarajalingam
2021/CSC/080

Throughout the day, Scroll..Scroll, Comment, Share, Post, Chat, React, Send Emails.
However, this seemingly endless interaction has a consequence: we're generating massive amounts of data that could become a looming threat akin to indestructible plastic waste. To put this into perspective, about 0.33 zettabytes of data are produced daily [1], and by the end of 2024, a staggering 149 zettabytes of data are projected to be both produced and consumed [2].



Can we make use of this enormous amount of data for better decision making and enhanced solutions for problems? Here's where Big Data Management comes into play.

First, let's understand what makes data as Big Data. As many could think, a large volume of data is not the only factor that makes data as Big Data.

There are five characteristics that are commonly used to differentiate as Big Data.

1. **Volume:** In addition to the enormous size of data being collected, considerations on its storage, processing demands as well as data preparation, curation and management processes define the volume characteristic.
2. **Velocity:** This refers to the speed at which the data arrives in Big Data environments. From an enterprise's point of view, the velocity of data translates into the amount of time it takes for the data to be processed once it enters the enterprise's perimeter.
3. **Variety:** This characteristic learns about the multiple formats and types of data that need to be supported. There are 3 primary types of data:
    i. Structured - Conforms to a data model or schema and is often stored in tabular form. For example, customer records.
    ii. Unstructured - Data that does not conform to a data model or data schema. For example, a text file that may contain the contents of various blog postings or tweets.
    iii. Semi-structured - Conforms to a defined level of structure and consistency, but is not relational in nature, instead hierarchical or graph-based. For example, XML.
4. **Veracity:** This tells about the quality or fidelity of data. In connection with veracity, data can be a part of the signal or noise of a dataset. Noise is data that cannot be converted into information and thus has no value, whereas signals have value and lead to meaningful information.
5. **Value:** It says the usefulness of data. Higher the data fidelity, the more value it holds. Value also depends on the time taken for data processing. Value of the data decreases with time, as it might become irrelevant.

Benefits of Big Data

1. **Data-driven decision making:** By analysing large volumes of data from various different sources, organisations can gain valuable insights and identify patterns, trends, and relationships that can guide their decision-making processes. This helps make better decisions to achieve the organisation's vision.
2. **Improved operational efficiency:** Big data analytics can enable businesses to streamline their operations and make them more efficient. They can do so by analysing processes, supply chains and allocation of resources. This helps in identifying the in-efficient areas and improving them or eliminating them, thus making the system cost-effective and productive.
3. **Enhanced customer understanding:** Businesses can analyse and utilise explicit customer data (what is shared about a person) and implicit customer data (information that is collected without individuals being aware) which may include purchase history, online presence, and engagement on publicising and social channels, to make their products and services more relevant to the customer. They can then develop tailored marketing efforts and make attempts to cater to different types of customers.
4. **Competitive advantage:** Big data, when analysed, helps a company develop a competitive edge over others. It helps identify upcoming market trends, opportunities that a company can exploit, and customer demands before the competitors. This, in turn, helps an organisation adjust its product or service offerings, develop new and innovative products and offerings and stay ahead in a technology-driven environment.
5. **Risk management:** Organisations can also use big data analytics to identify and address risks more efficiently. By analysing large data sets, organisations can better identify irregularities, trends and potential risks in real-time. This allows them to make a more proactive effort to prevent and mitigate risks, reduce fraudulent activities, and ensure compliance with industry regulations.

Some prerequisites for Big Data adoption

1. **Skilled Staffset:** People should be having knowledge in Big Data Tools and Technologies.
2. **A Substantial Budget:** Even though Big Data solutions are available as open source, an amount of budget is still required for activities like obtaining external data, storing and managing the data.
3. **Data Security and Privacy:** When analysing Big Data, it may reveal sensitive and/or confidential information. Therefore, a proper data governance framework should be implemented. Also, sufficient authentication and authorization mechanisms should be established.
4. **Data Quality:** The results will continue to be low, regardless of how good the Big Data solution is unless the data is accurate, relevant, and properly organised for analysis.
5. **Change Management:** Employees may be required to adjust to new tools, technologies, and data-driven decision-making techniques. Resistance to change and a lack of understanding of Big Data's potential may hinder the implementation [4].

Big Data Analytics Lifecycle

1. **Business Case Evaluation:** When it comes to the initial stage of the Big Data analytics lifecycle, things begin with setting up a clear business case, evaluating resources, challenges, and Key Performance Indicators (KPIs) while ensuring the problem aligns with the characteristics of Big Data.
2. **Data Identification:** The Data Identification stage involves identifying and sourcing the datasets needed for the analysis project, including both internal and external data sources, to increase the chances of discovering hidden patterns and correlations.
3. **Data Acquisition and Filtering:** During the Data Acquisition and Filtering stage, data is gathered from identified sources, filtered to remove irrelevant or corrupt data, and persisted for analysis, with metadata added to improve classification and querying, ensuring data accuracy and quality throughout the analytics lifecycle.
4. **Data Extraction:** The Data Extraction stage involves extracting and transforming disparate data to a compatible format for analysis by the Big Data solution, with the extent of extraction and transformation depending on the solution's capabilities and the type of analytics required.
5. **Data Validation and Cleansing:** The Data Validation and Cleansing stage involves establishing complex validation rules, removing invalid data, and leveraging redundancy to fill in missing valid data, ensuring data accuracy and quality in Big Data analyses.
6. **Data Aggregation and Representation:** The Data Aggregation and Representation stage involves integrating multiple datasets, considering differences in data structure and semantics, to achieve a unified view for improved data reusability and analysis capabilities.
7. **Data Analysis:** The Data Analysis stage involves conducting analysis tasks, which can be iterative and encompass various types of analytics, including confirmatory analysis with predetermined hypotheses and exploratory analysis for discovering patterns and anomalies.
8. **Data Visualisation:** Data Visualisation stage uses visualisation techniques and tools to help in better understanding and comprehension of results of analysis, thus helping business users in analysing and exploring the data to dig deeper for insights and feedback. It is important to ensure to select suitable visualisation techniques and provide the drill-down for a clear understanding of results.
9. **Utilisation of Analysis Results:** The Utilisation of Analysis Results stage involves determining how processed analysis data can be further utilised, potentially leading to the creation of models that improve business processes and inform the development of new systems or software programs.

Big Data Storage Concepts

1. **Cluster:** A cluster is a collection of servers or nodes, with similar specifications connected through a network to function as a unified entity, each node retaining dedicated resources for optimal performance and reliability.
2. **Distributed File System:** A file system (provides a logical view of the data stored on the storage device and presents it as a tree structure of directories and files), allowing storage of large files distributed across cluster nodes, enhancing data accessibility and flexibility, with examples like Google File System (GFS) and Hadoop Distributed File System (HDFS).
3. **NoSQL:** Stands for Not-only Structured Query Language. A NoSQL database management system offers high scalability and fault tolerance, efficiently storing semi-structured and unstructured data.
4. **Sharding:** Sharding is the process of horizontally partitioning a large dataset into a collection of smaller, more manageable datasets called shards. The shards are distributed across multiple nodes. Sharding allows the distribution of processing loads across multiple nodes to achieve horizontal scalability. A benefit of sharding is that it provides partial tolerance toward failures.
5. **Replication:** This means storing multiple copies (replicas) of datasets on multiple nodes, to provide availability, scalability and fault tolerance. Replication can be implemented in two different methods known as master-slave replication and peer-to-peer replication.
6. **CAP Theorem:** Also known as Brewer's theorem states the triple constraints Consistency, Availability and Partition Tolerance related to distributed database systems. It mentions that only two of the three constraints can be satisfied in a distributed database system running on a cluster.
7. **ACID:** It is the acronym that stands for Atomicity, Consistency, Isolation and Durability. ACID is the traditional approach to database transaction management as it is leveraged by relational database management systems.
8. **BASE:** Stands for Basically Available Soft state Eventual consistency. It is a database design principle that is based on the CAP theorem and leveraged by distributed technology. BASE supported database favours availability over consistency.

Big Data Processing Concepts

1. **Parallel Data Processing:** Parallel data processing involves dividing a larger task into smaller sub-tasks that run concurrently, typically achieved using a single machine with multiple processors or cores rather than multiple networks machines to reduce execution time and optimise data processing tasks.
2. **Distributed Data Processing:** Distributed data processing is similar to parallel data processing but involves decentralised processing using physically separate machines connected as a cluster.
3. **Hadoop:** Hadoop is an open-source framework for large scale data storage and processing that can handle various types of data and utilises the MapReduce processing framework for analysis.
4. **Cluster:** Supports scalability by breaking the larger datasets into smaller datasets and processing in distributed manner. It can be either processed in batch mode or realtime mode. Use of cloud infrastructure for cluster deployment enables elasticity and a pay-for-use model of utility-based computing.
5. **Processing in Batch mode:** Manages large datasets offline, with variable response times ranging from minutes to hours, necessitating data persistence before execution. It effectively handles volume and variety aspects, offering a simpler and cost-efficient approach commonly utilised for strategic analytics and ETL activities.
6. **Processing in Realtime mode:** It involves in-memory processing of data as it is captured, addressing the velocity characteristic of large datasets. Real-Time processing is also known as event or stream processing, where continuous or interval-based data is handled. Interactive mode, a subset of realtime, refers to real-time query processing, often used for operational BI/analytics. The Speed, Consistency, and Volume (SCV) principle is a fundamental concept in Big Data processing [3].

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Object-Oriented Programming

Understanding the Concepts

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2020/CSC/071

If you are a computer science or engineering student, there is no doubt you may have come across the word **Object-Oriented Programming** as often. Yet, if you don't know what that means or are ambiguous with their implementations, well you have your solution here.

Introduction

Before our explanation, let's see what a quick google search has to tell us about the OOP.

Object-oriented programming is a programming paradigm based on the concept of "objects", which can contain data and code.
As the above definition, OOP is a software designing pattern that is based on objects. Wait! what is an object?

Well, objects can be concerned as entities in your system. For instance, assume that we are about to develop a Car Service centre system. In such a case, we know **Car and ServicePerson** are the main entities in our system. So, those **Car** and **ServicePerson** are objects.

Hence, OOP is a design pattern that is concerned with the entities of your domain and their shared states (within the object itself), instead of relying upon functions that have private internal states.

Core Concepts of OOP

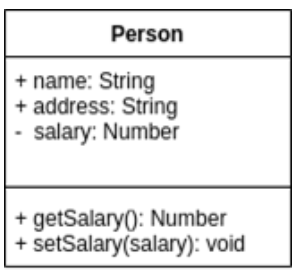
There are four main core concepts around OOP that help us to extend the capabilities of objects and make our software cleaner and robust.

- Encapsulation
- Abstraction
- Inheritance
- Polymorphism

Let's dive into each of these concepts one by one.

Encapsulation

We always tend to hide our private information from others, and so do the objects. In our entities, we have states that we don't want to expose to other objects and we don't need to let them mutate the states either. Encapsulation is a concept that evolves mainly in this concept. Through the support of encapsulation, we can hide the states of an object from the outside of that object and in the meantime, we can let other objects to access those states via methods that are already implemented inside the object, thus we can assure that the outsiders can only access or mutate states under the control of the relevant object. See the following example which clearly indicates Encapsulation.

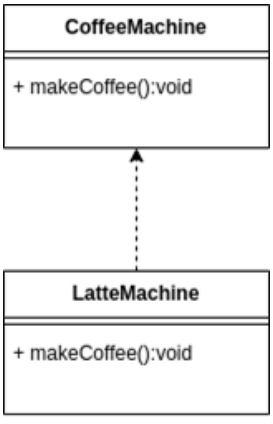



```
class Person{
  public String name;
  public String address;
  private Integer salary;

  Person(String name;String address){
    this.name=name;
    this.address=address;
  }

  public Integer getSalary(){
    return this.salary;
  }

  public void setSalary(int salary){
    this.salary=salary;
  }
}
```

As you can see in this case we hide the salary attribute from the outsiders because it is a piece of crucial information hence can only be accessed through the control of the Person class.

Abstraction

Have you ever wondered how a coffee brew machine works? Well, personally, I don't know because my coffee machine doesn't allow me to mediate in the coffee brewing process. I only know how to insert the coffee and milk into the machine. Well, this is the abstraction. Abstraction is a concept of hiding the advanced implementation and only exposing the higher-level mechanism to the end-user. Let's consider the following UML diagram,

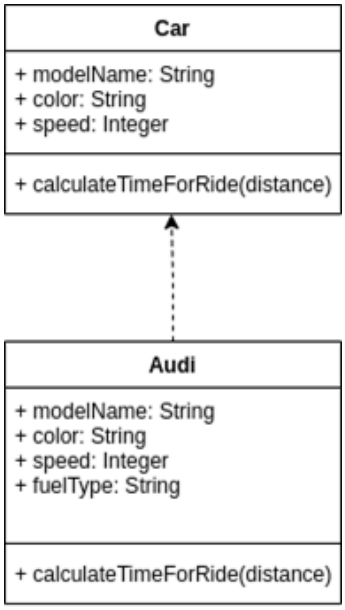


```
public class Coffee{
  public static void main(String[] args){
    CoffeeMachine machine = new LatteMachine(10,40);
    machine.makeCoffee();
  }
}



abstract class CoffeeMachine{
  public abstract makeCoffee();
}

class LatteMachine extends CoffeeMachine{
  private int sugarPercentage;
  private int milkPercentage;

  LatteMachine(int sugarPercentage,int milkPercentage){
    this.sugarPercentage=sugarPercentage;
    this.milkPercentage=milkPercentage;
  }

  public void makeCoffee(){
    System.out.println("Mixing "+this.sugarPercentage+"% of sugar and "+this.milkPercentage+" (
  }
}
```

If you consider the above code you can see that we are exposing the CoffeeMachine abstract class for our end-user in the public class Coffee and it implements LatteMachine's makeCoffee method just by keeping the eye on the makeCoffee abstract method in the CoffeeMachine abstract class, so it doesn't know how the makeCoffee method works in the LatteMachine class, and well, it doesn't need to.

Inheritance

Let me ask you a simple question, where did you get your skin colour? did you decide on your skin colour? As we know we get our skin colour from our heredity, right? We also can use this parent/child pattern in the object-oriented paradigm, where the child objects which has the same kind of functionalities and states can inherit those functionalities and states from the parent objects. See the following example where we use inheritance to make our code simpler.

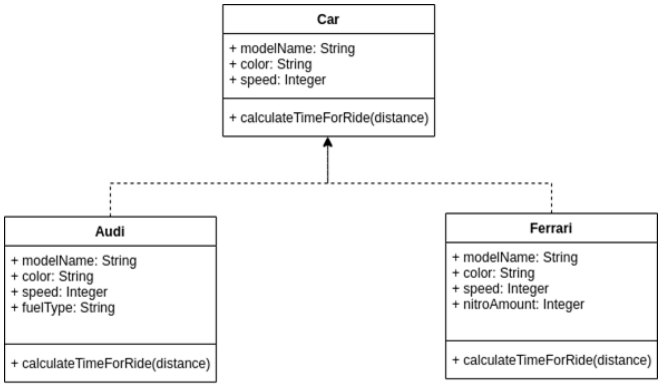


This example, as you can see we have a Car class where we specify basic properties and functionalities for a car and also we have an Audi class which extends the Car class, which gets us out of managing the Car functionality inside the Audi class. So, when we working on the Audi class we only have to care about the states and functionality that the Audi class explicitly use.

```
public class Main{
  public static void main(String[] args){
    Car mycar = new Audi("Q3","White",120,"Diesel");
    System.out.println(myCar.calculateTimeForRide(100));
  }
}

class Car{
  private String modelName;
  private String color;
  private Integer speed;

  Car(String modelName,String color,Integer speed){
    this.modelName=modelName;
    this.color=color;
    this.speed=speed;
  }

  public void calculateTimeForRide(int distance){
    return distance/this.speed;
  }

}

class Audi extends Car{
  private String fuelType;

  Audi(String modelName,String color,Integer speed,String fuelType){
    super(String modelName,String color,Integer speed);
    this.fuelType=fuelType;
  }
}
```

Polymorphism

Well if you are my friend from Greece I think probably you already know what Polymorphism means. However, for non-greek friends, Polymorphism means "many forms" in greek. Let me ask you a quick simple question, the way you comb your hair, is it the same as your father's? or do you have your own way? Whether you comb your hair in your own way or you inherit it from your parents, but yet you comb your hair, don't you? So, there are sometimes that we need to override the functionalities' implementations which we inherit from the parents so do the objects. See the following scenario,



In this scenario, as you can see we don't implement the calculateTimeForRide explicitly in the Audi class because the time calculation functionality is the same as in the Audi class as its parent class, the Car class; however in the Ferrari class, the time calculation functionality does change because Ferrari is a sports car and well it has some nitro that can increase its speed (btw calculation more likely to be wrong, I'm not a sports car fan, LOL). However, the point is in contrast to the Car class, the Ferrari class has different functionality for calculating time therefore we override the inherited functionality for the calculateTimeForRide inside the Ferrari class.

```
  private String modelName;
  private String color;
  private Integer speed;

  Car(String modelName,String color,Integer speed){
    this.modelName=modelName;
    this.color=color;
    this.speed=speed;
  }

  public void calculateTimeForRide(int distance){
    return distance/this.speed;
  }

}

class Audi extends Car{
  private String fuelType;

  Audi(String modelName,String color,Integer speed,String fuelType){
    super(String modelName,String color,Integer speed);
    this.fuelType=fuelType;
  }
}

class Ferrari extends Car{
  private Integer nitroAmount;

  Ferrari(String modelName,String color,Integer speed,Integer nitroAmount){
    super(String modelName,String color,Integer speed);
```

NB: In the JAVA programming language it supports two types of polymorphism. The first type would be Method Overriding which we have used in the above example, in there we implement the overriding method with the same name and same set of parameters as an addition we use Override annotation to inform the Java compiler about the overriding. Method overriding will replace the parent's implementation with the child's implementation. On the other hand, in Method Overloading, the second type of polymorphism in Java programming language, we implement the methods with the same method name but with different parameters or parameter types. This will not override the implementation from the parent class, however, which method to be called will change according to the parameters we pass to the method.

Conclusion

Most undergraduates or self-taught developers never realise the importance of Object-Oriented Programming until they have to learn frameworks such as Spring and NestJs which are currently in high demand in the field of software engineering these days. However, it's harder to learn those frameworks when you don't have a robust understanding of the core of Object-Oriented Programming. So, I think this article would have helped you to tighten your knowledge of Object-Oriented Programming.

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