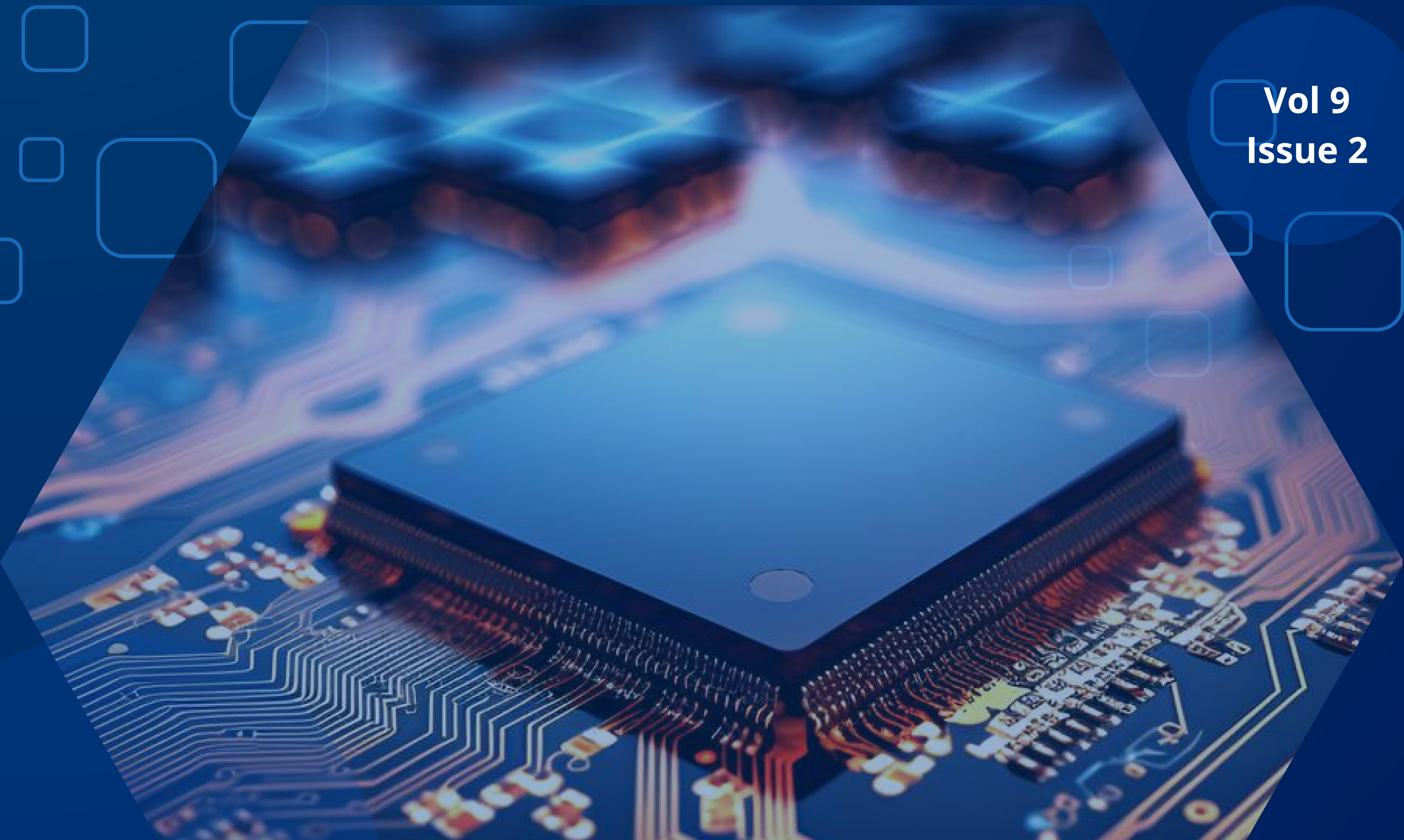
EEE ASSOCIATION

TRONICALS

Vol 9
Issue 2



Cover Story:

ENSURING RELIABILITY AND RESILIENCE: FPGA-BASED FAULT TOLERANCE AND REDUNDANCY TECHNIQUES

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
NATIONAL INSTITUTE OF TECHNOLOGY TIRUCHIRAPPALLI

CONTENT

EDITORS NOTE

Welcome to Tronicals 9.2, where we embark on an exciting journey into a realm of all things Electrical and Electronics. EEE Association stands as a testament to the relentless pursuit of knowledge, innovation, and technological advancement. With every passing year, we witness astounding breakthroughs, and this symposium is a celebration of those achievements.

We hope Tronicals serves as your guiding star in this constellation of brilliant ideas and concepts. It is our privilege to bring together EEE enthusiasts to exchange insights, foster collaboration, and inspire the future.

In a world where technology shapes our lives, EEE plays an instrumental role. It powers our gadgets, fuels our connectivity, and steers our progress. This symposium encapsulates the heart of EEE, offering a platform for exploration, discourse, and inspiration.

Join us in this thrilling adventure as we delve into the limitless potential of EEE. We invite you to engage, learn, and chart the course for a future that's electric, electronic, and extraordinary!

~ Anushree, Jyosna, Varun
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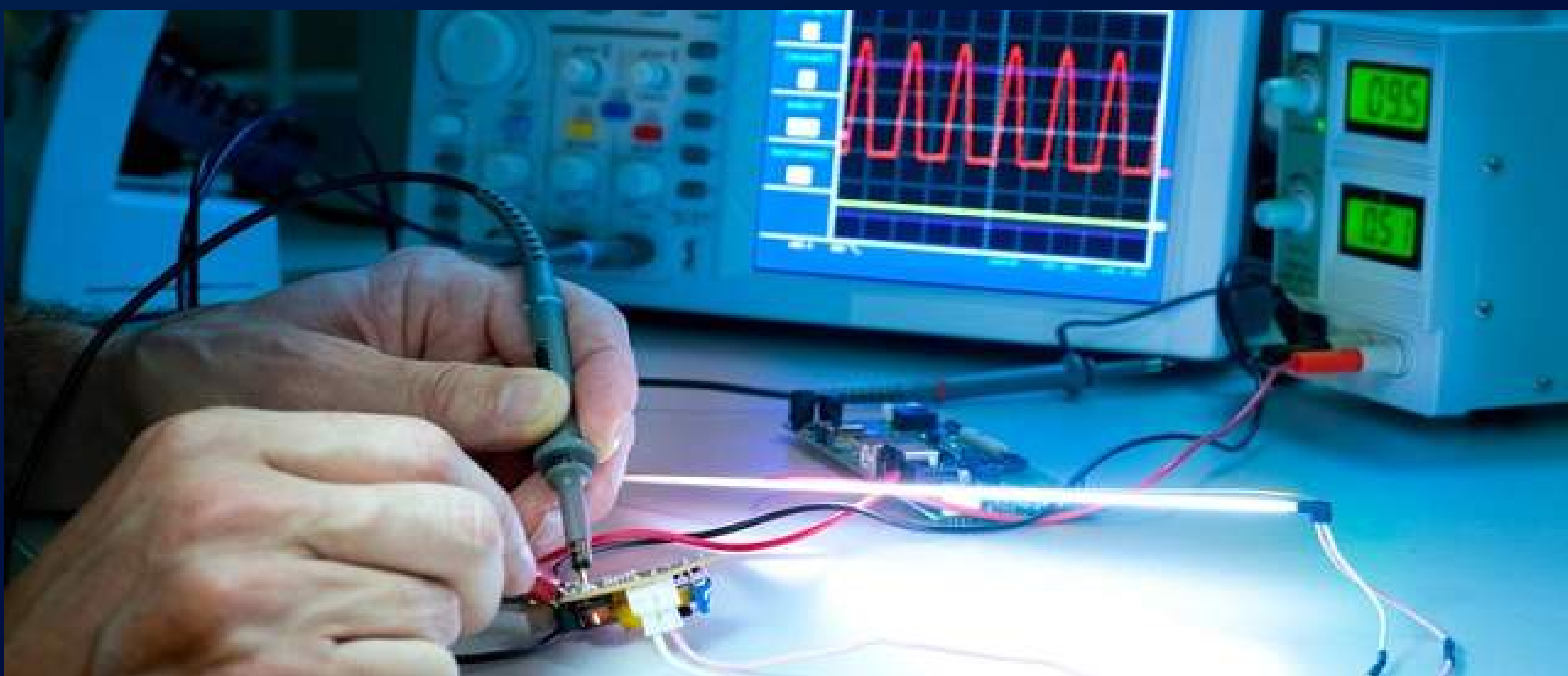
Message from the H.O.D Dr.M.P Selvan

I'm delighted to introduce the latest edition of Tronicals, our department's bi-annual newsletter, which showcases the remarkable achievements of our faculty and students in the field of Electrical and Electronics Engineering. Our department is one of the oldest departments of the institute and has a rich history of teaching and research excellence and has recently seen a surge in postgraduate placements in core sectors, thanks to our exceptional education.

Our faculty members have made significant contributions, resulting in multiple granted patents, and we've achieved an international QS subject ranking of 451-500. Dr. K. Sundareswaran, one of our distinguished professors, has been recognized as one of the top 2% scientists in the field of electrical and electronics engineering by Stanford University.

The commitment of the EEE department is to engage students into numerous industry-related projects and thereby provides real-world exposure. Notably, an undergraduate student has been offered an opportunity to pursue his fourth year of study at IIT Madras and will be offered direct Ph.D. admission based on his academic excellence. The EEE department's achievement is so substantial that our B.Tech. programme has recently earned a 6-year accreditation from the National Board of Accreditation.

I applaud all contributors and the editorial team for their dedicated work on this edition. I hope you find it informative and enjoyable. Happy reading!



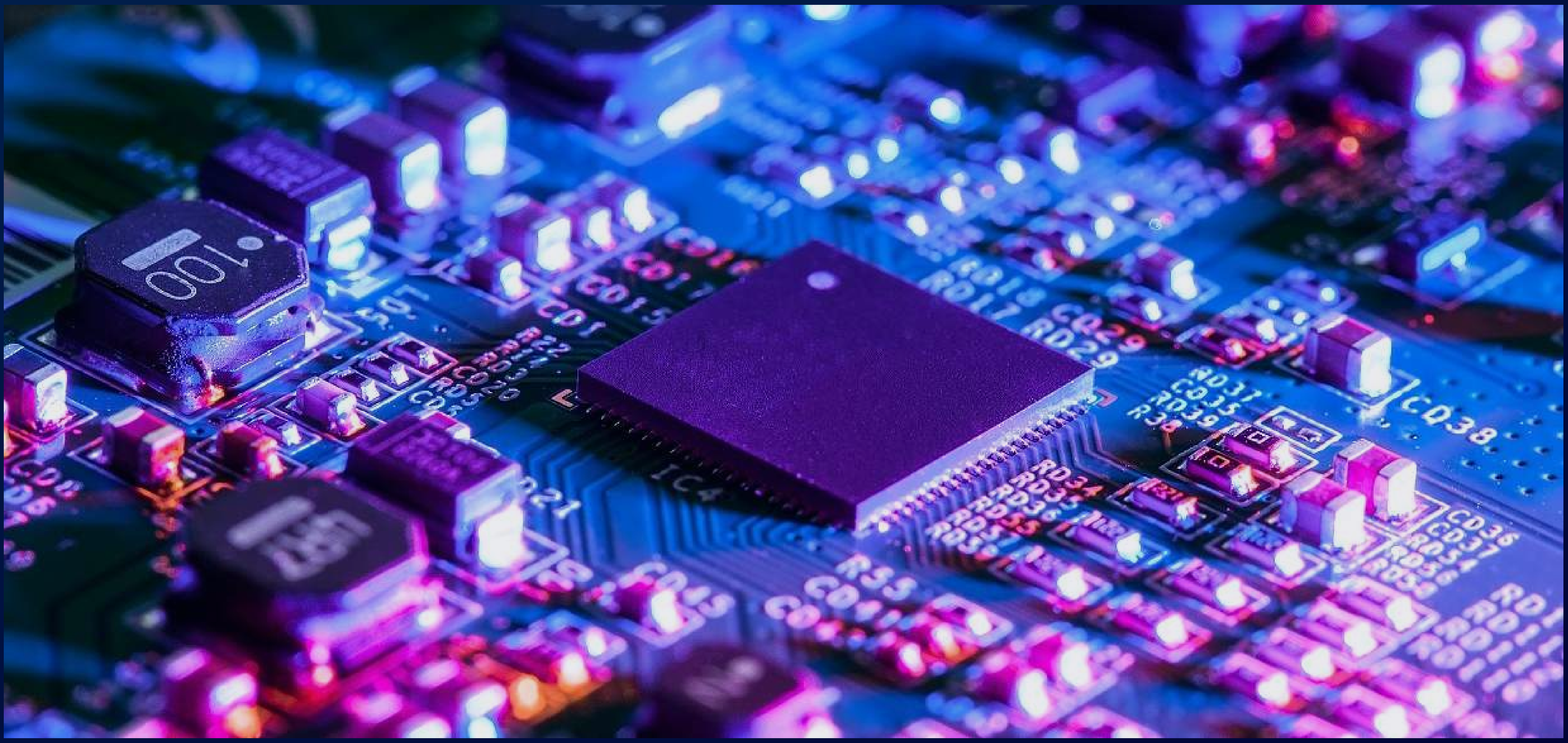
Message from the Faculty Advisor Dr. Josephine R. L.

Greetings on behalf of the EEE Association and Tronicals ! It brings me great joy to serve as the faculty advisor for the EEE Association.

Currents, our annual symposium, stands as a testament to our commitment to fostering innovation and excellence within our department. Through a diverse array of activities such as expert talks, technical workshops, and cash-prized events, we continually strive to push the boundaries of technological advancement. Our emphasis on green energy sustainability, particularly in the realm of Electric Vehicles, reflects our dedication to shaping a more sustainable future.

I am proud to note the increasing involvement of our students in real-time projects, showcasing their passion for learning and their drive to make meaningful contributions to society. Furthermore, initiatives like 'LIGHT UP' underscore our commitment to social responsibility, providing valuable opportunities for knowledge sharing and community engagement.

As we continue on this journey of growth and innovation, let us remain steadfast in our pursuit of excellence and our commitment to making a positive impact on the world around us. Together, we can achieve great things and pave the way for a brighter tomorrow.



VISION AND MISSION OF THE DEPARTMENT

ABOUT

The department of Electrical and Electronics Engineering, NIT Tiruchirappalli was started in 1964. It offers one Under-Graduate programme (B.Tech.), two Post-Graduate programmes (M.Tech. in Power Systems and M.Tech. Power Electronics) and also research programmes (M.S. and Ph.D.) in the various fields of Electrical and Electronics Engineering. After the institute became NIT, the department has grown not only in terms of student and faculty strength but also in improving the laboratory facilities for teaching and research purposes. The department is recognised for excellence in research, teaching and service to the profession.

The faculty members have a strong sense of responsibility to provide the finest possible education for both graduate and undergraduate students. The academic strength of the faculty is reflected by the alumni, many of whom are in the top echelons of industry and academia both in India and abroad.

VISION

To be a centre of excellence in Electrical Energy Systems.

MISSION

- Empowering students and professionals with state-of-art knowledge and Technological skills.
- Enabling Industries to adopt effective solutions in Energy areas through research and consultancy.
- Evolving appropriate sustainable technologies for rural needs

B. TECH PROGRAMME

Programme Educational Objectives

The major objectives of the B.Tech. programme in Electrical and Electronics Engineering are to prepare students:

- For graduate study in engineering
- To work in research and development organisations
- For employment in electrical power industries
- To acquire job in electronic circuit design and fabrication industries
- To work in IT and ITES industries

Programme Specific Outcomes

1. Apply fundamental knowledge of Electrical , Electronics and Computer Engineering concepts to understand, analyse and solve complex problems in Power Engineering and allied areas.
2. Analyse, design and develop Electronics circuits and systems
3. Adapt to the changing needs for self and continuous learning, communicate effectively and practise professional ethics for societal benefits.

Programme Outcomes

The students who have undergone the B.Tech. programme in Electrical and Electronics Engineering (EEE):

- Will have an ability to apply knowledge of mathematics and science in EEE systems.
- Will have an ability to provide solutions for EEE problems by designing and conducting experiments, interpreting and analysing data, and reporting the results.
- Will have comprehensive understanding of the entire range of electronic devices, analog and digital circuits with added state-of-art knowledge on advanced electronic systems.
- Will have knowledge and exposure on different power electronic circuits and drives for industrial applications.
- Will have in-depth knowledge in transmission and distribution systems, power system analysis and protection systems to pursue a career in the power sector.

PROGRAMME OUTCOME

- Will have a good knowledge in microprocessors/microcontrollers, data structures, computer programming and simulation software.
- Will be able to develop mathematical modelling, analysis and design of control systems and associated instrumentation for EEE.
- Will be able to systematically carry out projects related to EEE.
- Will have an ability to participate as members in various professional bodies as well as multidisciplinary design teams.
- Will demonstrate the ability to choose and apply appropriate resource management techniques so as to optimally utilise the available resources.
- Will be proficient in English language in both verbal and written forms which will enable them to compete globally.
- Will have confidence to apply engineering solutions with professional, ethical and social responsibilities.
- Will be able to excel in their professional endeavours through self-education.
- Will be able to design and build renewable energy systems for developing clean energy and sustainable technologies.

M. TECH PROGRAMME

Programme Educational Objectives

The major objectives of the M.Tech. programme in Power Systems are to equip the students with adequate knowledge and skills in Power Systems Engineering and to prepare them for the following career options:

- Research programmes in Power Systems Engineering.
- Employment in power research and development organisations.
- To work in electric power industries and energy sectors.
- Faculty positions in reputed institutions.

Programme Outcomes

A student who has undergone M.Tech. programme in Power Systems (PS) will:

- Have an ability to evaluate and analyse problems related to Power Systems and be able to synthesise the domain knowledge and incorporate the principles in the state of art systems for further enrichment.
- Be able to critically investigate the prevailing complex PS scenarios and arrive at possible solutions independently, by applying the acquired theoretical and practical knowledge.
- be able to solve PS problems such as load flows, state estimation, fault analysis and stability studies.
- Be able to develop broad-based economically viable solutions for unit commitment and scheduling.
- Be able to identify optimal solutions for improvising power transfer capability, enhancing power quality and reliability.
- Be able to evolve new schemes based on literature survey, and propose solutions through appropriate research methodologies, techniques and tools, and also by designing and conducting experiments.
- Be able to interpret power system data and work on well-defined projects with well defined goals to provide real time solutions pertaining to PS.

- Be able to develop, choose, learn and apply appropriate techniques, various resources including hardware and IT tools for modern power engineering, including prediction and modelling with an understanding of the limitations.
- Be able to develop dedicated software for analysing and evaluating specific power system problems.
- Be able to participate in collaborative-multidisciplinary engineering / research tasks and work as a team member in such tasks related to PS domain, giving due consideration to economic and financial intricacies, and lead the team in specific spheres .
- Be able to confidently interact with the industrial experts for providing consultancy.
- Be able to pursue challenging professional endeavours based on acquired competence and knowledge.
- Be a responsible professional with intellectual integrity, code of conduct and ethics of research, being aware of the research outcomes and serve towards the sustainable development of the society.
- Be capable of examining critically the outcomes of research and development independently without any external drive.

CURRENTS INTIATIVE

2024

Through Currents 24, EEE Association facilitated a discussion with Mr. Srini V Vasan, an esteemed alumni from NIT Trichy, class of '92. The focus of the conversation centered around the significance of providing internship opportunities to students as a means to foster their career development and professional growth. He emphasized how internships can bridge the gap between theory and practice, inspiring students to pursue opportunities aligning with their career goals.

Beyond the educational pursuits, as part of our ongoing commitment to social responsibility, the EEE Association organized a session on mathematics for students of class 6, class 7 and class 8 at REC school on 20th february. Dr. Angayar, an esteemed member of our academic community, led the session with enthusiasm and expertise. Through interactive discussions and engaging activities, Dr. Angayar not only imparted fundamental mathematical concepts but also instilled a passion for learning within the students. By nurturing their interest in mathematics, we aim to empower these young minds with the essential skills and knowledge needed to excel academically and beyond.

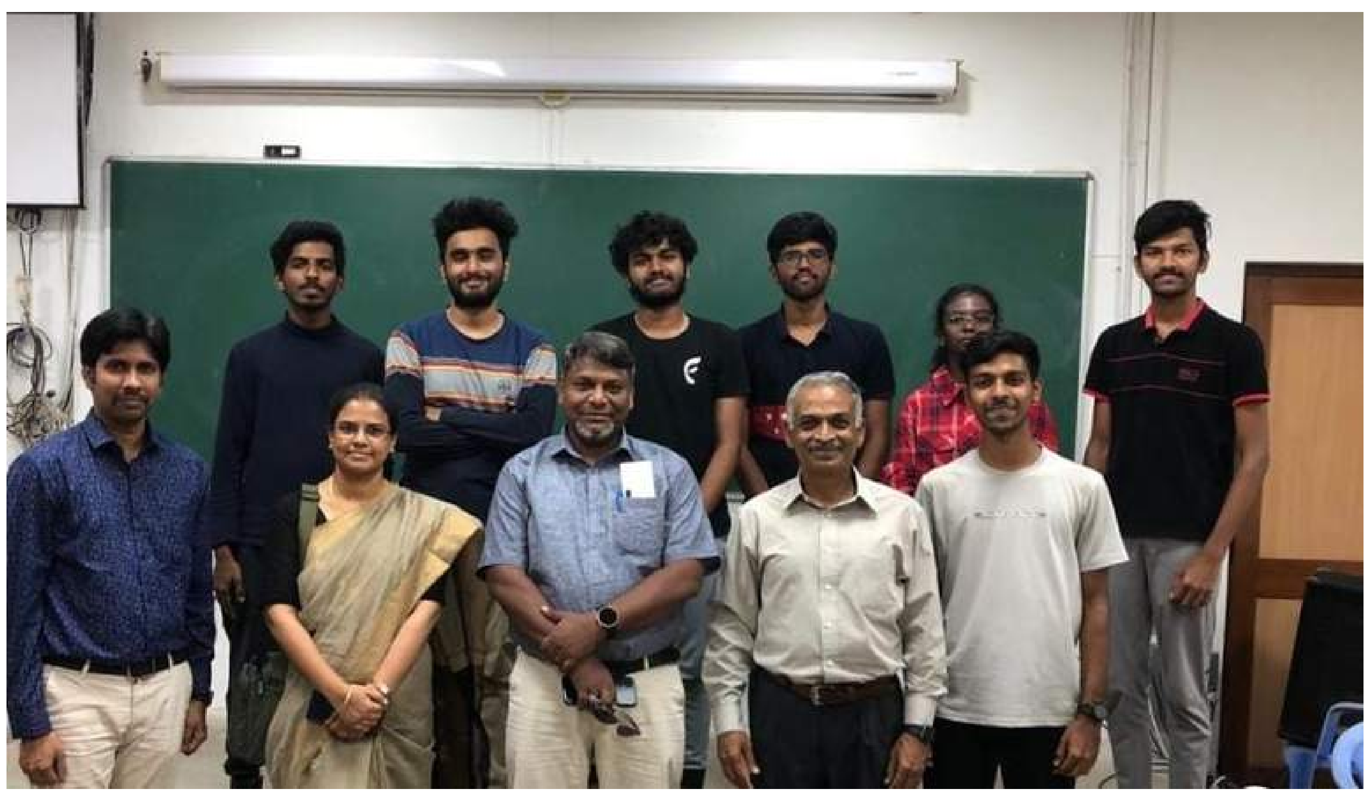
Mr. Richard Sekar, a distinguished alumni of the '83 batch of REC/NIT Tiruchirappalli, has made significant contributions both professionally and socially. Currently serving as “Vice Chairman, CBOC, Ohlone College in California, USA”, he oversees substantial funding totaling INR 2800 Crores.

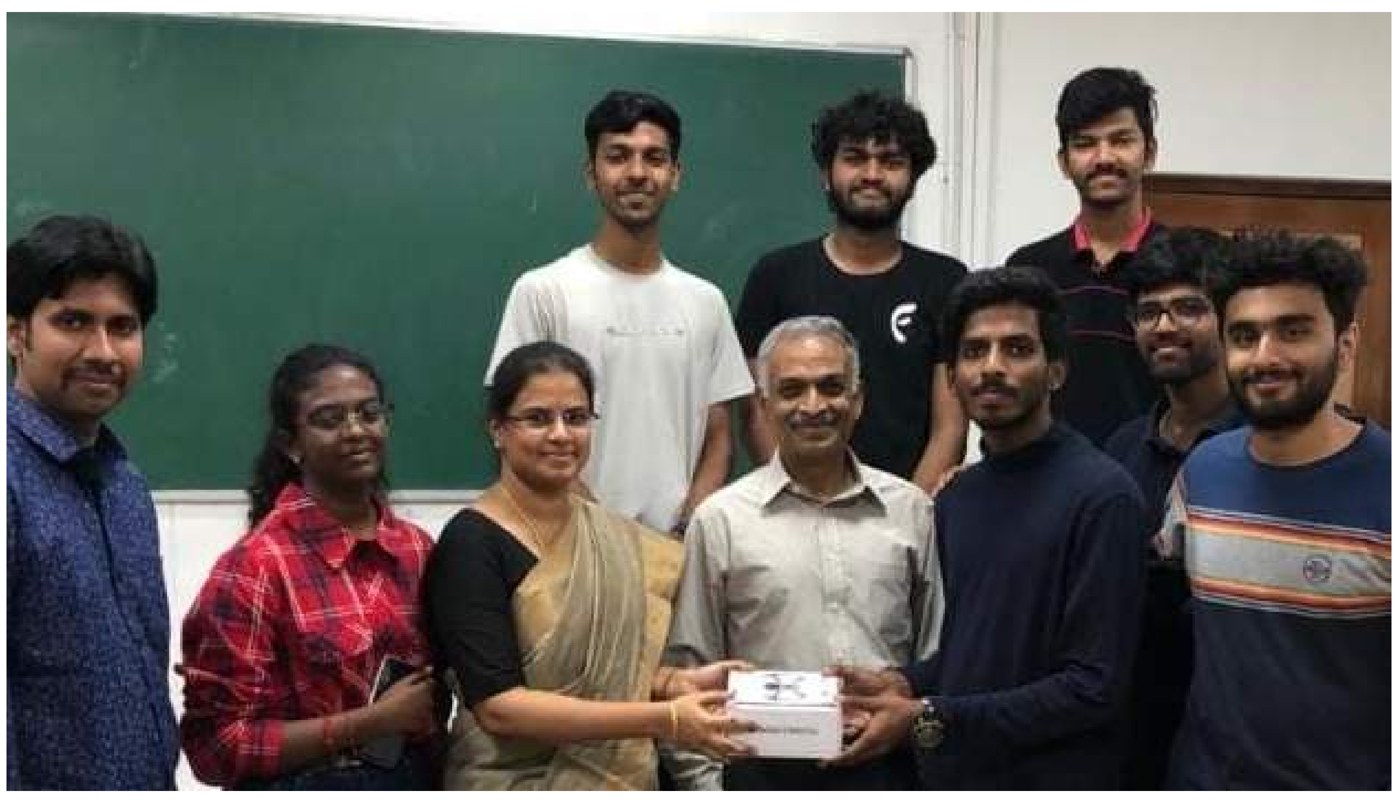
His involvement with initiatives like the Truck Mounted Street Vacuum Cleaner project showcases his commitment to fostering innovation and providing opportunities for the NITT students. This project not only benefited the community but also facilitated the admission of all participating students into universities in the USA, leading to promising career prospects. Furthermore, Mr. Sekar's recent endeavor, the Tankless Water Controller project, highlights his dedication to addressing societal needs to provide water access to villagers.

Mr. Richard Sekar's commitment to NITT's students and faculty shines through his leadership in spearheading impactful projects like the Mobile Automatic River Cleaner, Sentry Drones, High Impact Resistant Car Bumper, Perpetual Electricity from Ocean Waves and Levitation Vehicles.

The EEE Association extends its heartfelt gratitude to Mr. Richard Sekar for his invaluable contributions to society and for providing wonderful opportunities to our students. We extend our best wishes to Mr. Sekar and the students for the successful completion of their projects.

We are also happy to announce that the sentry drones project has been kick started on 13th march 2024 and kit of drones were handed over to the team. It had been also collaborated with CEDI-NIT, Tiruchirappalli to have their own startups and making entrpreneurial dreams come true.





On March 6th, Mr. Richard Sekar led an interactive session with students and offered 20 EEE students an opportunity to work on projects under his guidance. This hands-on experience promises invaluable learning and growth for students.

Students views on their projects

Levitation Vehicle

Aastha Agarwal - 107122003
Aatman Patel - 107122073
Rudraksha Anasane - 107122095
Ritik Siklighar - 107122091
Sreenivas S - 107123116

We are truly honored to have the opportunity to collaborate with Richard Sekar Sir on his project regarding magnetic levitation for fast transportation. Richard Sir is renowned for his technological contributions that benefit society, offering solutions that are both economically feasible and scalable. Thanks to Josephine ma'am, we were able to establish a connection with Richard Sir, and we eagerly anticipate commencing our collaboration with him in October '24.

The project aims to enhance the practicality and affordability of magnetic levitation, drawing insights from existing technologies or pioneering new ones. During our one-hour meeting with Richard Sir, one key takeaway was his emphasis on continually exploring new avenues and thinking outside the box, coupled with the importance of punctuality. His insights were truly enlightening, and we express our gratitude to him for entrusting us with this opportunity. We are committed to delivering our best efforts and look forward to contributing to the project's success.

Mobile Automatic River Cleaner

Arjun B K - 107122016
Athish I S - 107122018
Logithsuriya M A - 107122060
Sherwin Kumar M - 107122102
Amritavarshini - 107123010

Our goal is to create a robotic device to detect and remove river debris. I'm grateful to the organizers and Mr. Richard Sekar Sir for this opportunity, and I appreciate the diverse learning experience across various domains like design, remote sensing, hydrodynamics, and material sciences. Despite being a first-year student, I feel valued within our inclusive team. I thank my seniors for supporting, guiding and accepting to work with them on this project. Throughout this project, I'm excited to develop problem-solving skills and gain real-time learning experiences.

Sentry Drones
Pavan Krishna - 107122075
Rakshnaa Nachiyar Suresh - 107123088

The Sentry Drones Project is an innovative initiative aimed at developing advanced drone technology for a variety of security applications. I would like to thank Dr.Josephine ma'am for providing an opportunity to work with her and team and also grateful to Mr. Richard Sir for trusting us.

The project revolves around creating Sentry Drones that can perform surveillance tasks more efficiently and cost-effectively than traditional methods. These drones are designed to monitor designated areas continually. With the ability to cover vast areas and reach difficult-to-access locations, these drones enhance safety and security measures.

As a first year I improved my viewpoints on how to look at a problem and how to solve it. Throughout this project I look forward to learning and empowering myself with leadership skills, team coordination and professional and technical experience.

High Impact-Resistant Car Bumper
Shreya Nambiar - 107123108
Sukrithi Raman - 107123124

I am thrilled to be part of the high impact-resistant car bumper project with my team. Our goal is to develop a car bumper with unparalleled impact resistance for enhanced vehicle safety. Our focus is on improving the impact of resistance in a car bumper so that it would be capable of absorbing shock during low speed collisions and further prevents damage to the vehicle. I am extremely grateful to the organizers and Mr. Richard Sekar Sir for this opportunity and I appreciate the diverse learning experience across various domains like design, vehicle dynamics, manufacturing and material sciences. Thank you for entrusting us with this opportunity to learn and develop professionally. I look forward to making the most of it and contributing to the success of the project.

PERPETUAL ELECTRICITY FROM OCEAN WAVES
Sandeep Srinivasan - 107123098

"You are the vanguard of knowledge and consciousness, a new wave in the vast ocean of possibilities."
- Jim Carrey

I am thrilled to team up with like minded individuals in generating perpetual electricity from ocean waves - a first of its kind. This project aims in bringing out the latent potential from ocean waves and converting it into electricity, significantly cutting down our dependence on non renewable and exhaustive resources for electricity generation, thereby pledging our support in manifesting a sustainable environment. The best part here is that the electricity generation process can go on and on - forever , without the need for a halt that could disrupt the electricity generation process. I'm excited to dive deep into the technical aspects and unlock a door full of opportunities that can help me gain real time learning experiences.

My initial interactions with the project heads- Mr. Richard Sekar and Dr. Josephine was nothing short of an admiration, and being a EEE undergrad myself, I can't wait to explore the intricacies of the work I'll be doing and how it would be creating a ripple effect across the world.

ENSURING RELIABILITY AND RESILIENCE: FPGA-BASED FAULT TOLERANCE AND REDUNDANCY TECHNIQUES

TIn the rapidly evolving landscape of digital design and electronic systems, the demand for reliability and resilience has become paramount. As electronic devices find their way into critical applications such as aerospace, healthcare, and automotive systems, the need to mitigate the impact of faults and enhance system robustness has led to the exploration of advanced fault tolerance techniques. Amidst these strategies, the utilization of FPGA-based fault tolerance and redundancy techniques emerges pivotal, playing a crucial role in guaranteeing the sustained and reliable operation of digital systems.

Field-Programmable Gate Arrays (FPGAs) offer unparalleled flexibility in digital design, allowing engineers to tailor hardware configurations to specific applications. However, FPGAs are susceptible to transient faults arising from factors such as radiation, electrical noise, and environmental conditions – commonly known as soft errors. Nowadays, these are the biggest challenges in the design, development, and evaluation of the reliability of digital circuits. Owing to these errors, the digital circuits may operate incorrectly and can fail, necessitating the implementation of fault tolerance mechanisms to safeguard against potential disruptions.

FACTORS CONTRIBUTING TO THE SEMICONDUCTOR BOOM IN INDIA

One of the cornerstone techniques employed in FPGA-based fault tolerance is **Triple Modular Redundancy (TMR)**. TMR is a widely used technique that involves triplicating the critical components of a system, such as logic circuits or memory. Three identical modules perform the same computation, and a voting mechanism is used to determine the correct result. In FPGA designs, TMR can be applied by triplicating the relevant logic or registers and using voter circuits to compare the outputs. If one module produces an incorrect result due to a fault, the other two can outvote the faulty one.

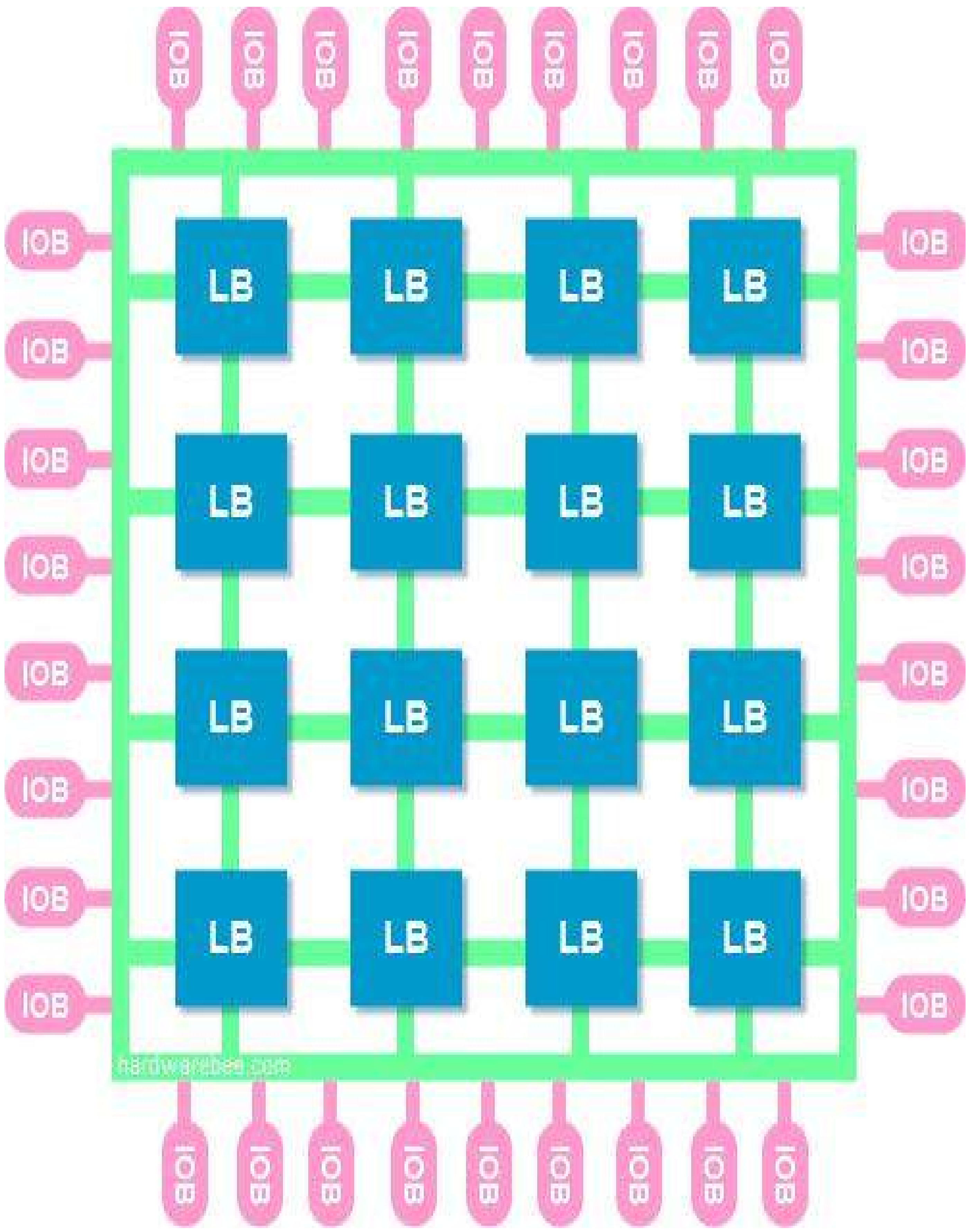
Partial Reconfiguration is another key technique, allowing for the dynamic modification of a portion of the FPGA while the rest of the system continues to operate. This approach is particularly valuable for bypassing faulty components and maintaining system functionality without requiring a full system reset, as in the case of conventional programming.

Next comes the Error Detection and Correction mechanisms, such as parity and Error-Correcting Code (ECC), which play a crucial role in identifying and rectifying errors in data stored within FPGAs.

ECC, in particular, provides the ability to detect and correct single or multiple-bit errors, ensuring the integrity of critical data and enhancing the robustness of the system. Various techniques are used to locate the changed bit, as each bit in the configuration memory represents a specific point in the circuit.

Watchdog Timers, integrated into FPGA designs, continuously monitor system operation. Many modern FPGAs boast built-in watchdog timers with configurable settings like timeout periods and reset options. If the system fails to provide a periodic "heartbeat" signal indicative of normal operation, the watchdog timer can trigger a system reset to recover from a fault. If the logic fails to reset the timer before it reaches zero, the watchdog triggers a predefined action. This proactive approach to fault recovery contributes to the overall resilience of FPGA-based systems.

Built-In Self-Test (BIST) is a hardware-based testing method where a circuit is equipped with its own testing capabilities, allowing it to independently generate and evaluate test patterns to detect faults or defects without external test equipment. These mechanisms allow the FPGA to identify and isolate faulty components, contributing to the early detection and rectification of faults, thereby enhancing the overall reliability of the system.



REDUNDANCY TECHNIQUES

There are also FPGA-based redundancy techniques for ensuring the reliability of electronic systems. **Hot redundancy** employs standby components ready to take over immediately upon the failure of a primary component, suitable for applications where minimizing downtime is critical. On the other hand, **Cold redundancy** switches to backup components only after a failure, offering power efficiency but potentially resulting in a longer recovery time. **Spatial redundancy** involves duplicating critical modules on the FPGA, ensuring a redundant copy can seamlessly take over if a module fails. **Temporal redundancy**, specifically time redundancy, executes tasks multiple times, allowing the system to rely on correct results from redundant executions in the event of a fault. These techniques collectively contribute to fault tolerance and uninterrupted functionality in FPGA-based systems.

CONCLUSION

In conclusion, the increasing integration of electronic devices into critical applications demands a heightened focus on reliability and resilience. The exploration of advanced fault tolerance techniques, particularly within the context of Field-Programmable Gate Arrays (FPGAs), has become pivotal in ensuring the sustained and reliable operation of digital systems. FPGAs, while offering unparalleled flexibility in digital design, face challenges such as transient faults or soft errors originating from factors like radiation and environmental conditions. These challenges underline the importance of implementing fault tolerance mechanisms to mitigate potential disruptions.

These FPGA-based fault tolerance and redundancy techniques collectively contribute to uninterrupted functionality and enhanced reliability in electronic systems, addressing the challenges posed by soft errors and ensuring the robust operation of digital circuits. As technology continues to advance, these strategies will play a pivotal role in shaping the future of fault-tolerant and resilient electronic systems across various critical applications.

~Uma Gomathi,III year

SNEAKY SOLUTION- ADVANCEMENTS IN FPGA TECHNOLOGY TO PREVENT RESIDENTIAL MICROGRID POWER THEFTS

TIn the rapidly evolving landscape of digital design and electronic systems, the demand for reliability and resilience has become paramount. As electronic devices find their way into critical applications such as aerospace, healthcare, and automotive systems, the need to mitigate the impact of faults and enhance system robustness has led to the exploration of advanced fault tolerance techniques. Amidst these strategies, the utilization of FPGA-based fault tolerance and redundancy techniques emerges pivotal, playing a crucial role in guaranteeing the sustained and reliable operation of digital systems. Field-Programmable Gate Arrays (FPGAs) offer unparalleled flexibility in digital design, allowing engineers to tailor hardware configurations to specific applications. However, FPGAs are susceptible to transient faults arising from factors such as radiation, electrical noise, and environmental conditions – commonly known as soft errors. Nowadays, these are the biggest challenges in the design, development, and evaluation of the reliability of digital circuits. Owing to these errors, the digital circuits may operate incorrectly and can fail, necessitating the implementation of fault tolerance mechanisms to safeguard against potential disruptions.

RESIDENTIAL MICROGRID THEFT AND ITS CONSEQUENT IMPACT

One of the most significant issues associated with microgrid theft is financial loss for the microgrid operator. Unauthorized tapping into the grid or tampering with meters leads to a loss of revenue, affecting the economic sustainability of the microgrid.

Power theft necessitates increased efforts for monitoring, detection, and maintenance which may incur additional costs to identify and address instances of theft, leading to higher operational expenses.

Power theft can cause overloading and unbalancing of the microgrid. Unauthorized connections or excessive power consumption by individuals or entities stealing electricity may strain the microgrid's capacity and lead to operational issues.

Microgrid theft can contribute to fluctuations in voltage and frequency, leading to grid instability. This instability can affect the overall performance and reliability of the microgrid, potentially causing disruptions in power supply to legitimate users.

Tampering with smart meters and other monitoring devices can lead to inaccurate data reporting. This not only impacts the microgrid operator's ability to monitor and manage the system efficiently but also hinders accurate billing for legitimate users.

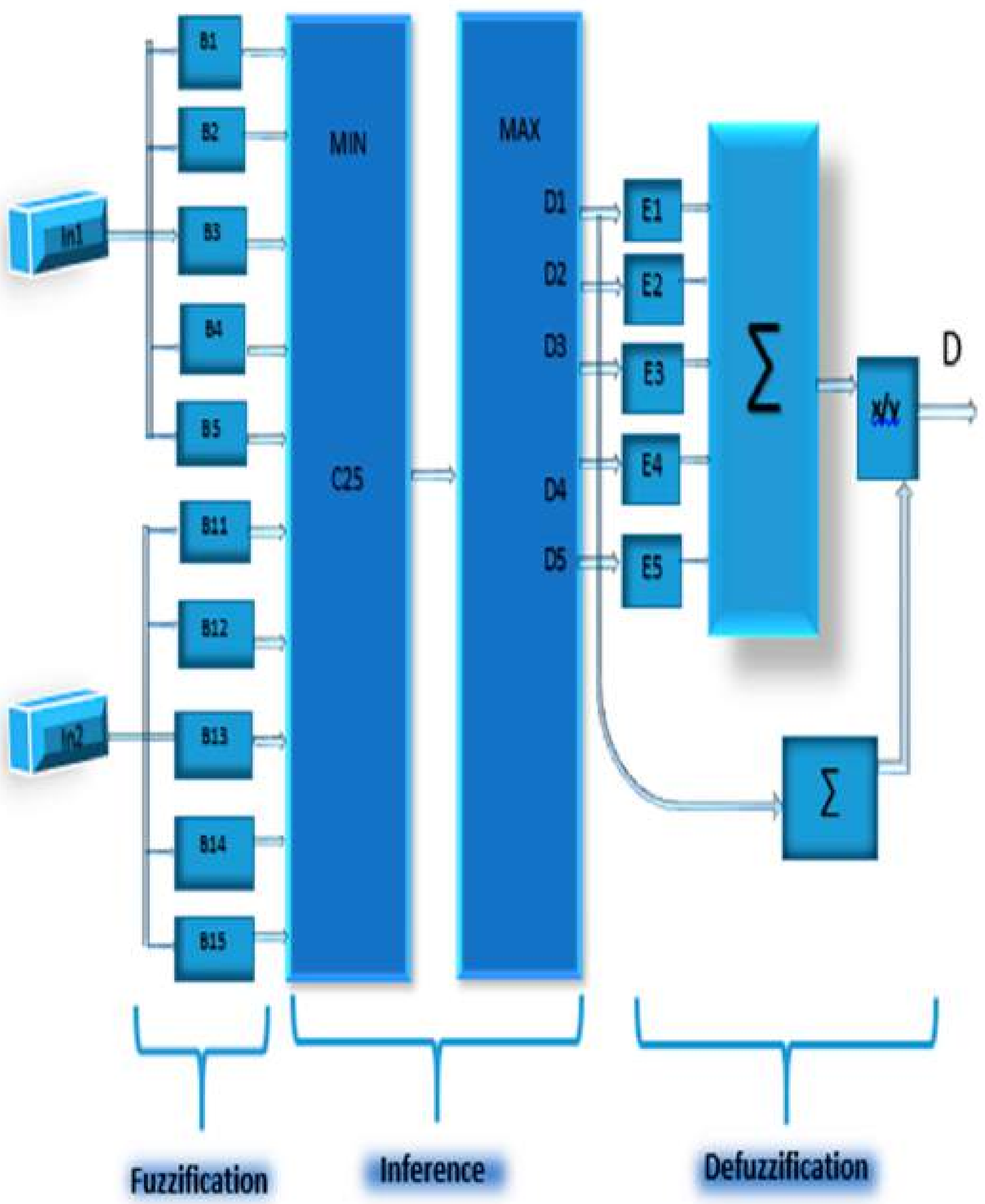
Power theft often involves illegal connections and modifications to the microgrid infrastructure. This can compromise the integrity of the system, leading to wear and tear, increased maintenance requirements, and potential long-term damage.It undermines the principles of efficiency and reliability by disrupting the balance and stability of the system. This reduction in efficiency can lead to increased downtime and decreased overall reliability.The microgrid operator may face regulatory penalties for failing to prevent power theft, and law enforcement may need to get involved to address the issue.

Power theft can have broader community impacts. It can lead to disparities in access to electricity, as those engaged in theft may have an unfair advantage over law-abiding residents. Additionally, the overall quality of service for legitimate users may suffer.

THE REVOLUTION BROUGHT BY FPGA IN PREVENTING SUCH POWER THEFTS

Field-Programmable Gate Arrays, known for their flexibility and adaptability, are emerging as a key player in fortifying residential microgrids against power thefts. Several advancements in FPGA technology contribute to creating a secure and tamper-resistant environment within microgrid systems.

Smart Meter Authentication:
Implementation of advanced authentication mechanisms in smart meters, ensuring that only authorized users have access to the microgrid is possible through FPGA. This prevents external entities from manipulating energy consumption readings.



Secure Communication Protocols:
FPGA-based systems facilitate the development of secure communication protocols within microgrid components. This enhances the integrity of data transmission, safeguarding against unauthorized access and manipulation of critical information.

Tamper Detection and Response:
They can play a role in designing systems that can detect physical tampering with the microgrid infrastructure. This includes tamper-resistant enclosures for components such as smart meters, with FPGAs implementing security measures that respond to such incidents. Real-time monitoring of power consumption patterns is made possible through FPGA technology. Anomalies trigger immediate alerts, enabling quick detection of irregularities that may indicate unauthorized power consumption or attempted theft.

Encryption and Data Security:
FPGAs play a pivotal role in implementing robust encryption algorithms, ensuring the confidentiality and integrity of data exchanged within the microgrid. This protects sensitive information from falling into the wrong hands.

Dynamic Load Balancing:
FPGA-driven dynamic load balancing algorithms optimize power distribution, not only improving overall efficiency but also aiding in the identification of abnormalities that might signify power theft or unauthorized access.They are known for their programmability and flexibility. This allows for easier updates and enhancements to security protocols as new threats emerge or as technology advances.

As residential microgrids become increasingly prevalent, the imperative to secure them against power thefts grows. FPGA technology emerges as a powerful ally in this endeavor, offering customizable solutions to fortify smart meters, enhance communication security, and enable real-time monitoring. Implementing these technological advancements is crucial to ensuring the long-term sustainability and reliability of residential microgrids, paving the way for a future where decentralized energy generation is not only efficient but also secure.

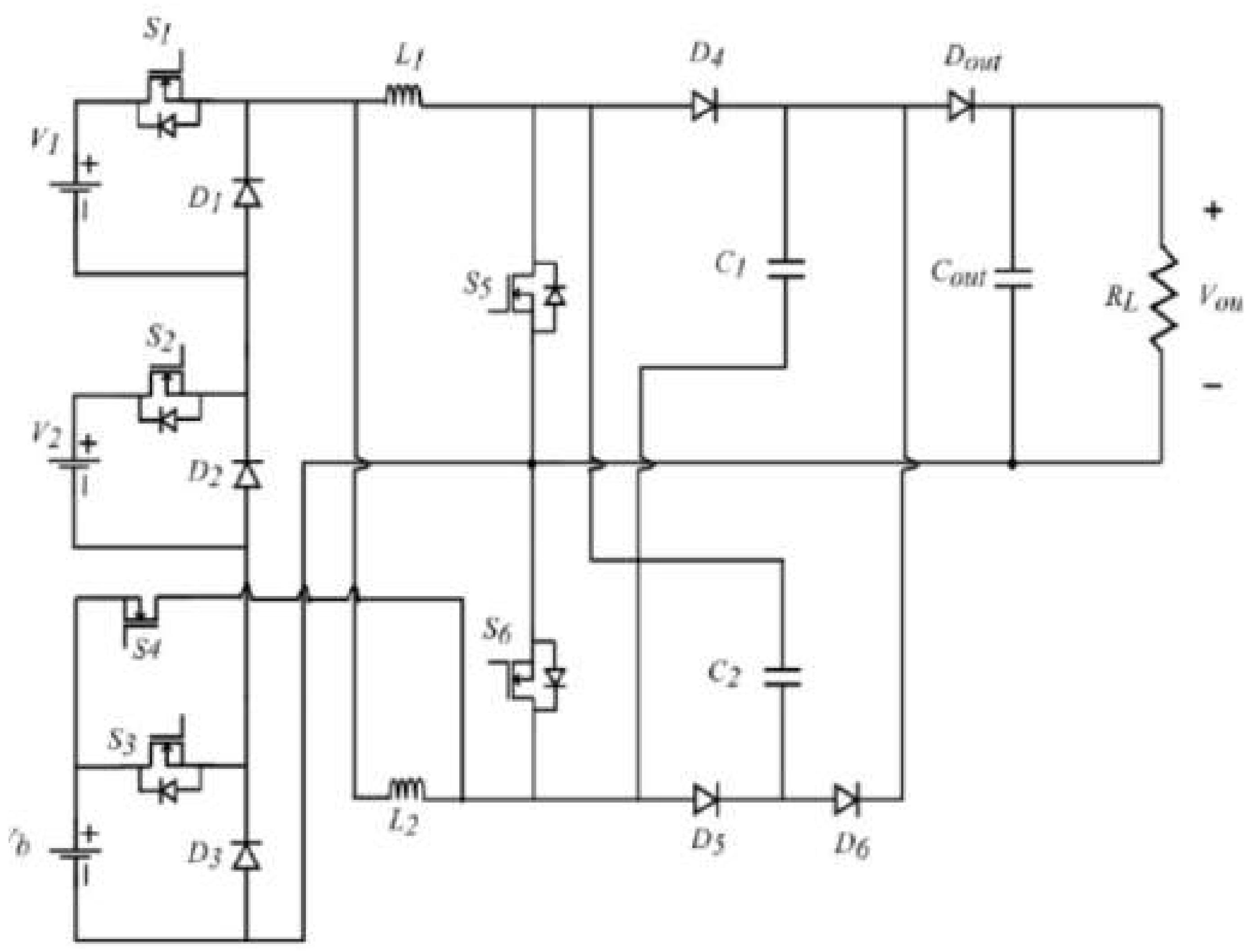
~Shreeya Rajaganapathy,III year

BATTERY INTEGRATED MULTIPLE INPUT DC-DC CHOPPER

The integration of a battery, multiple input sources, and a chopper circuit defines a cutting-edge energy management system. This sophisticated setup addresses the challenge of harmonizing diverse power sources like solar panels or wind turbines with a battery's voltage output. The chopper circuit, a dynamic DC-DC converter, plays a pivotal role by regulating energy flow and adjusting voltage levels to meet specific load requirements or efficiently charge the battery. A super advanced energy management system is made by combining a battery, different power sources, and a special circuit. This setup is really smart as it solves the problem of making solar panels or wind turbines work well with a battery. The key player here is the chopper circuit, which is like a dynamic converter for electricity. It controls how energy moves around and changes the voltage to match what the battery needs. To make this system work perfectly, it's crucial to really understand how each part works and have a strong plan for controlling everything. This setup is a flexible and effective way to handle modern challenges in getting and storing energy.

CONVERTER TOPOLOGY

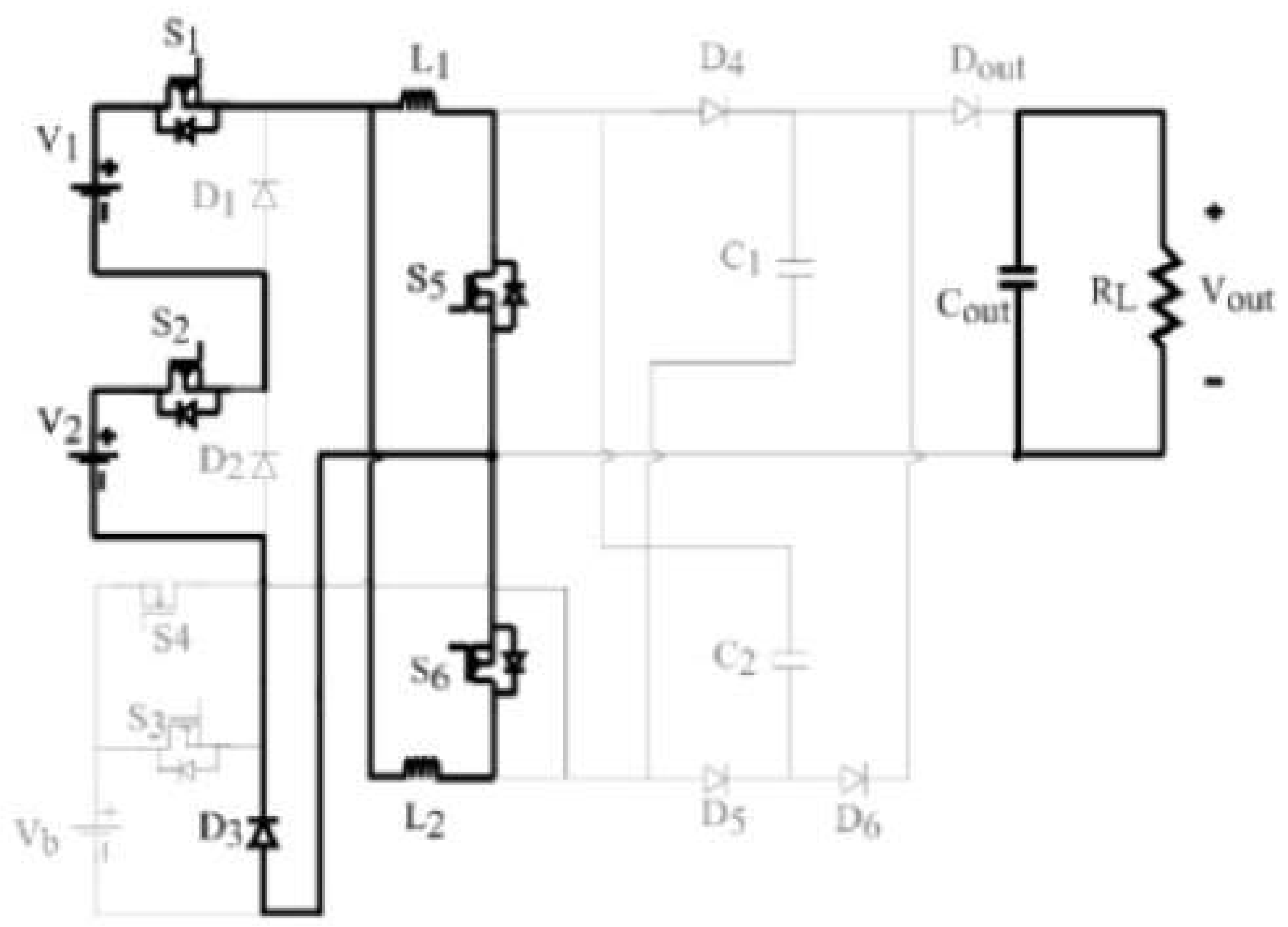
The proposed converter topology is introduced along with the operation modes and circuit analysis. The proposed structure is presented in the figure below. Three distinct sections of the converter can be identified where the input section is the interleaving section and the VM (Voltage Multiplier) section. The VM section has a combined single stage of VM cell with capacitors C1, C2 and diodes D4 - D6.



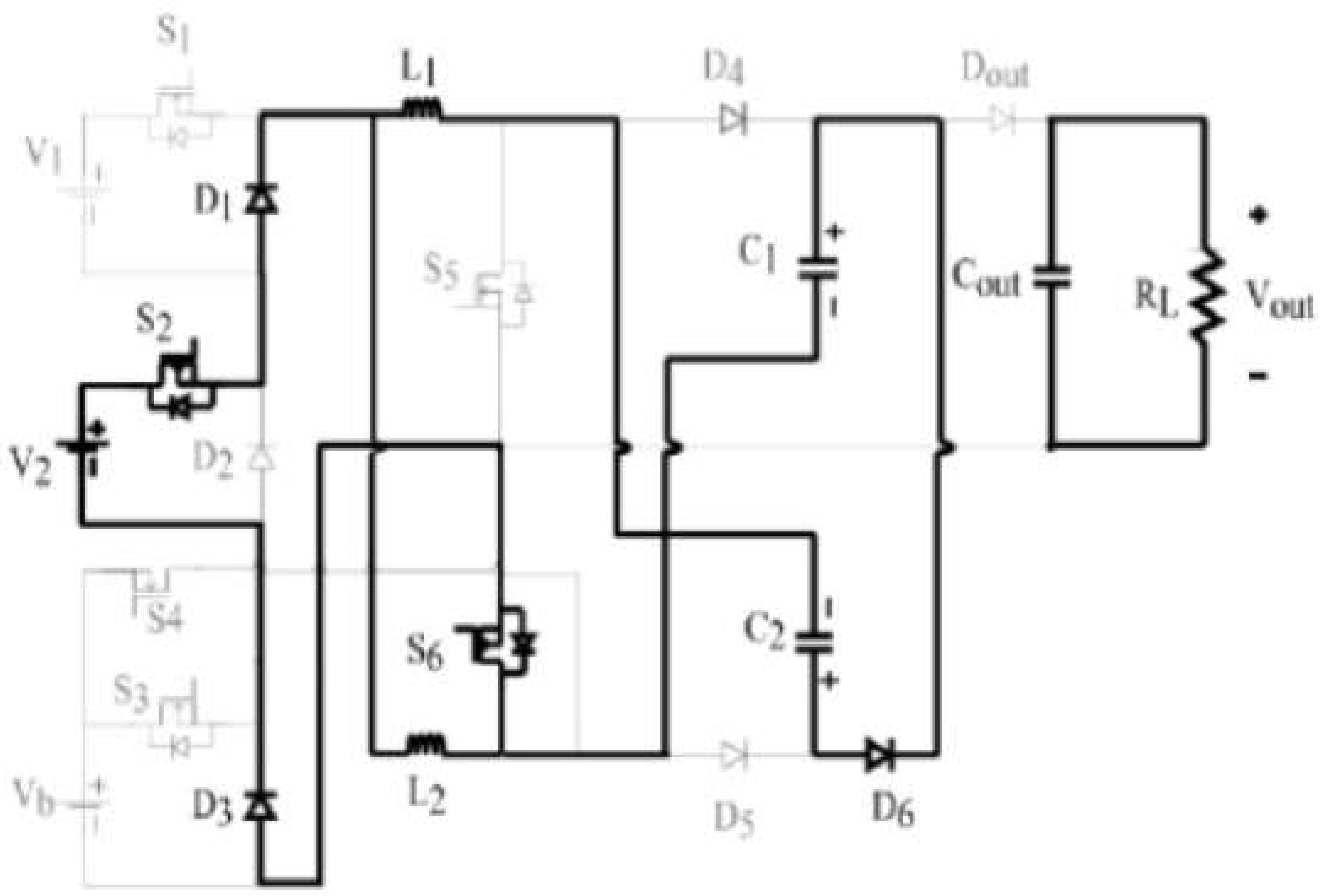
OPERATION MODE

The operational synergy of this circuit circuit constitutes an intricate energy management system. The dynamic DC-DC chopper circuit assumes a pivotal role in intricately regulating the electric flow, fine-tuning voltage levels, and optimizing energy distribution for either powering loads or charging the battery in accordance with specific requisites. In this mode, the battery state of charge is optimal, and the power of input sources V1 and V2 can sufficiently serve the load. During this operation mode, the battery neither charges nor discharges. This is the default operation mode. In this mode, S3 and S4 are permanently turned off. The switching sequence in this operation mode is explained as follows:

Switching mode 1 [0 < t < D1T] :
Switches S1, S2, S5, and S6 are turned on. Input source, the sum of V1 and V2 charges inductors L1 and L2. Diode D3 is forward biased and all other diodes are reverse biased. Capacitors C1 and C2 are idle while Cout delivers power to the load.

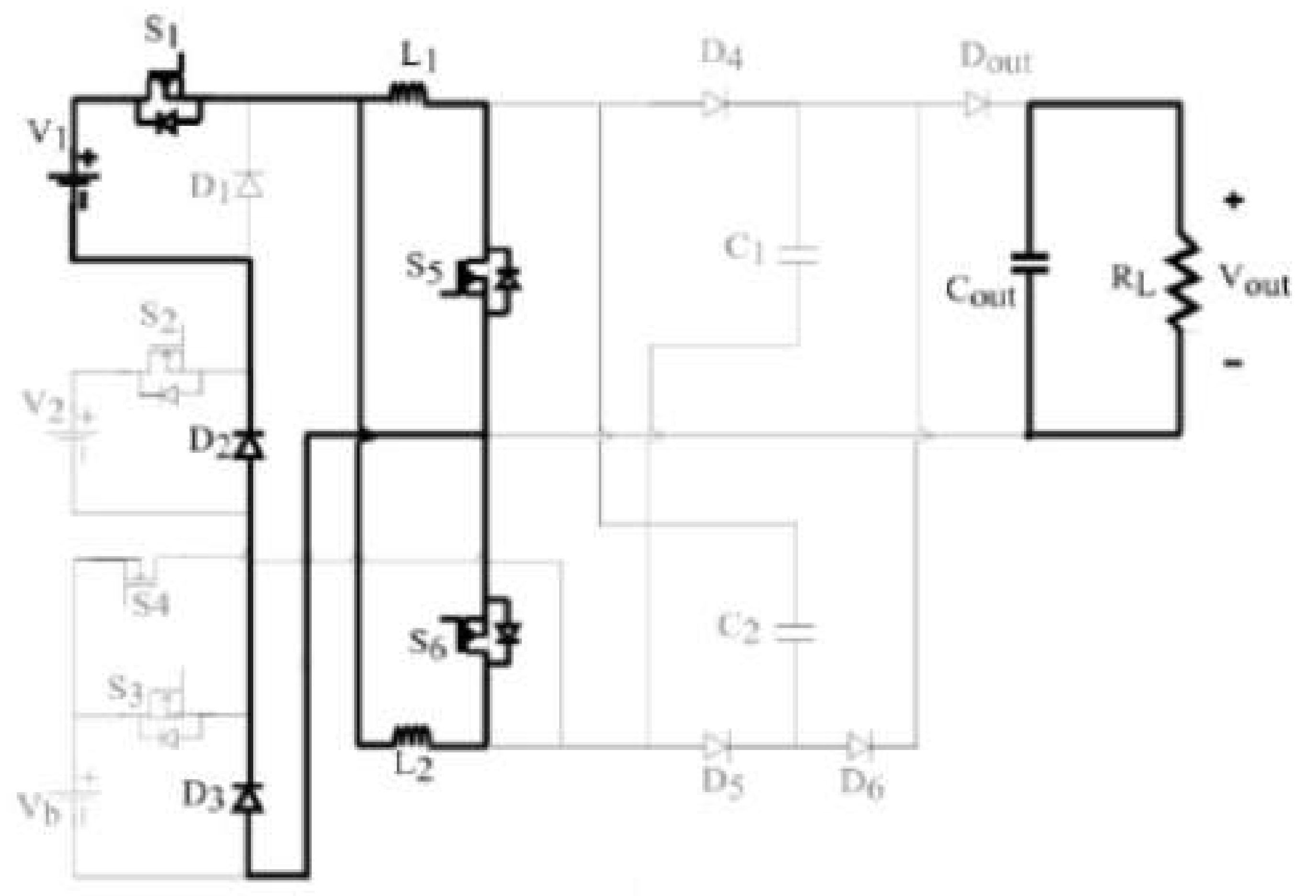


Switching mode 2 [D1T < t < D2T] :
During this switching interval, switch S2 continues conducting while S1 is turned off. Similarly, the interleaving switch S5 is turned off and S6 continues conducting. D6 is forward biased. L1 and C2 charge the capacitor C2 and Cout serves as the load.



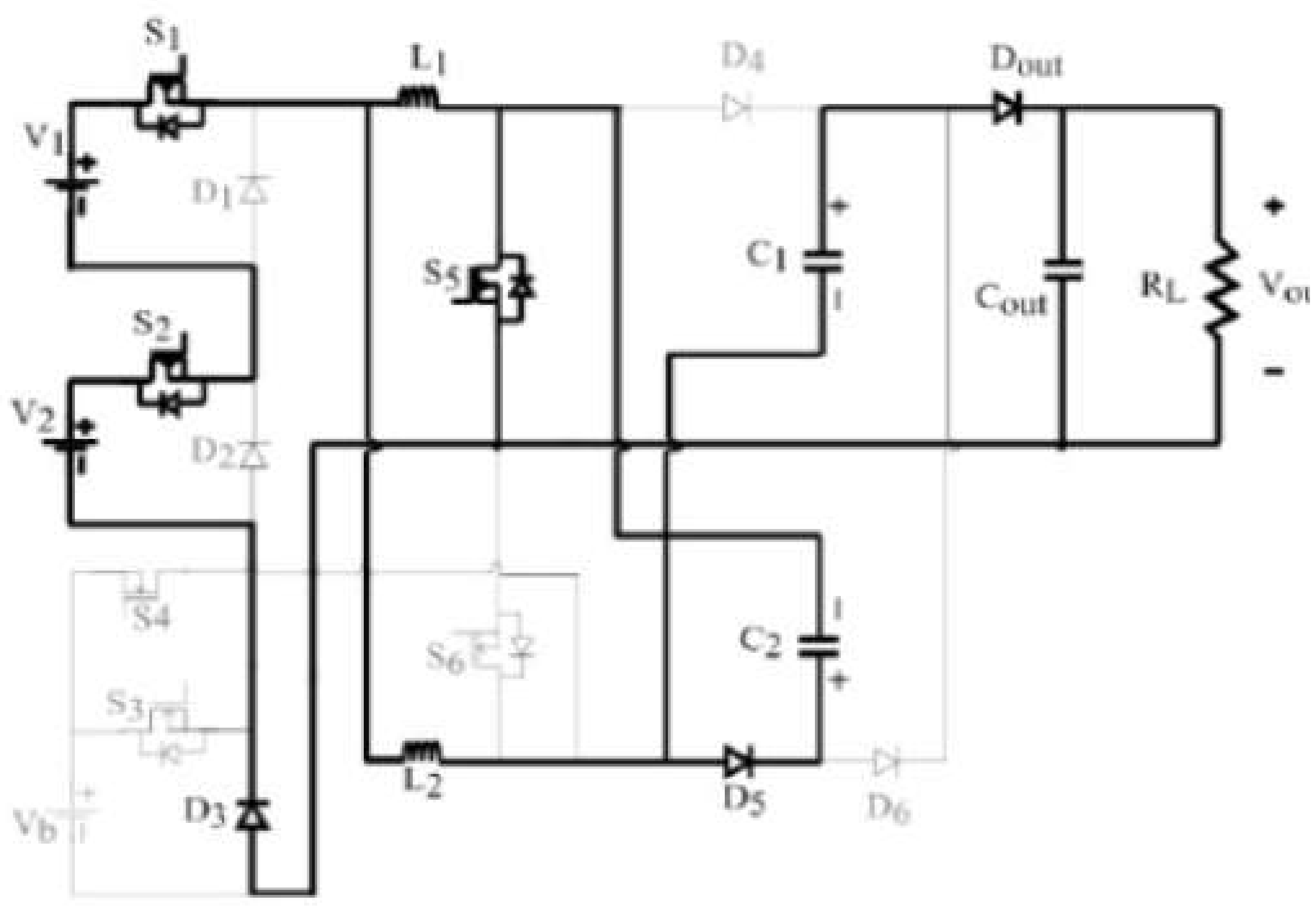
Switching mode 3 [D2T < t< D3T]:

In this interval of switching operation, S2 is turned off and S1 is turned on. S5 and S6 are turned on. V1 charges L1 and L2. C1 and C2 are idle and Cout services the load again.



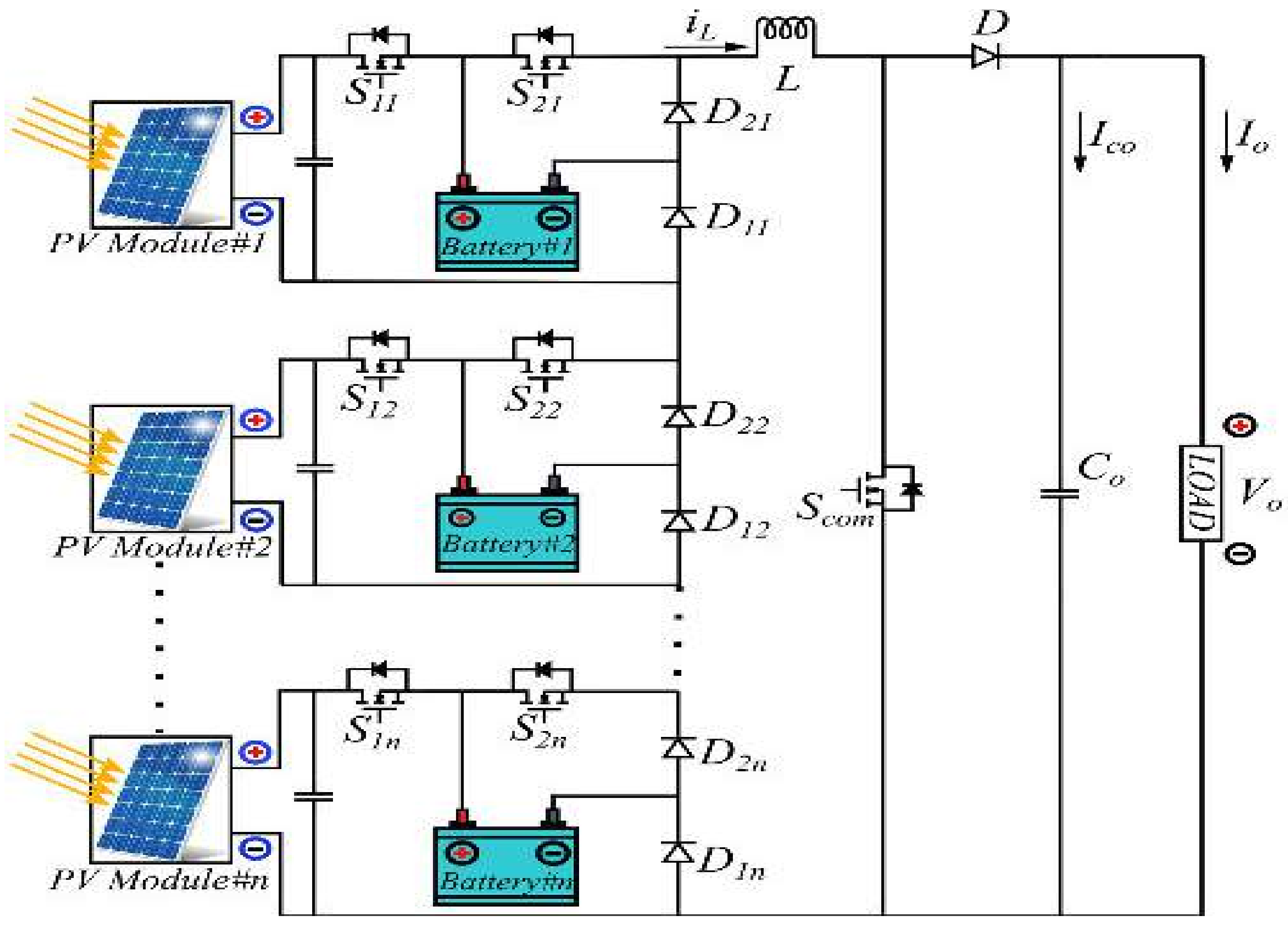
Switching mode 4 [D3T < t < T] :

V1, V2 and Vb deliver power to the converter through switch S1, S2 and S3 respectively. L1 is charged through S5. C2 is charging while C2 discharges and L2 delivers power to the load.

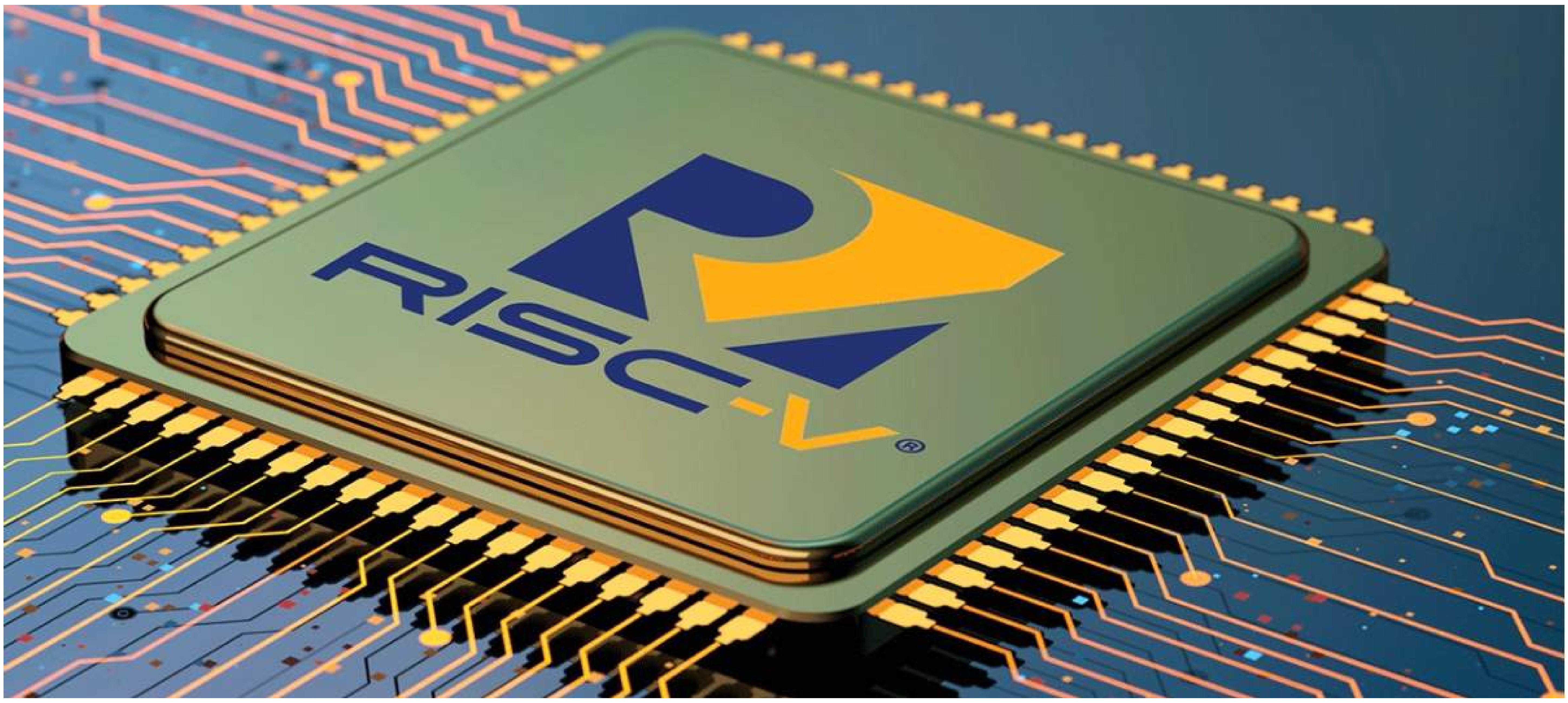


The proposed multi-input converter achieves high output voltage in an interleaved nductor topology by taking advantage of two VM (Voltage Multiplier) cells placed after the interleaving stage. The converter can provide energy from three sources. There are two unidirectional input ports and a bidirectional input port that is suitable for battery storage. The individual energy sources can be controlled by their respective power switches. The battery storage port is a major advantage of the proposed converter. Excess energy from renewable energy sources can be stored in the battery. On occasions of inadequate power, this stored energy can be channeled to satisfy the power requirements.

The charge and discharge rate of the bidirectional port is dependent on the duty ratio of the power switch. Thus, the proposed converter is appropriate for use in Renewable Energy applications.



~Keerthana,III year



RISC-V

RISC-V (pronounced "risk five") is basically a set of instructions for designing computer processors. But instead of being locked away in a secret vault like most other processor designs, it's open and free for anyone to use and build upon. Imagine it like a blueprint for building houses, but anyone can modify it to make tiny bungalows, huge mansions, or even floating cities!

THE HISTORY OF RISC-V

RISC-V began as a project at UC Berkeley to create an open-source computer system based on RISC principles. It was initially designed for academic use. The standard has evolved and is now managed by RISC-V International.

The RISC-V International organization has moved its headquarters to Switzerland to maintain neutrality for designers worldwide without any government regulations.

The ecosystem is emerging and growing to support the standard. As the adoption rate accelerates, industry collaboration continues, further evolving the architecture.

WHY IS RISC-V IMPORTANT?

When it comes to disruptive technology, investors question its impact and importance to the industry. Anything that will shape an industry or set a new standard will usually impact the industry.

For RISC-V, some of its notable impacts are:

Democratizing Processor Design

One of RISC-V's biggest benefits is that it's an open-standard ISA. With traditional proprietary ISAs, there is a limitation on innovation and competition due to only a handful of companies controlling the architecture. RISC-V's open-source setup allows startups, researchers, and enthusiasts to develop, experiment, and commercialize their processor designs. This accessibility can lead to a surge of innovation, drive advancements across the industry and stimulate healthy competition that will benefit consumers.

Accelerated Development and Research

Thanks to its open-source licensing, RISC-V has helped accelerate R&D in the processor space. By eliminating licensing issues, R&D teams can experiment freely with new processor designs or test new concepts while pushing the boundaries of performance, security, and power efficiency. In addition, having an open-source community allows further collaboration and knowledge sharing that can help contribute to the growth of architecture and help the progress of technology. RISC-V has allowed designers to create processors to meet specific needs thanks to its modular nature.

KEY APPLICATIONS OF RISC-V

1. Embedded Systems and IoT:

Low-power RISC-V processors are ideal for resource-constrained devices like wearables, smart sensors, industrial controllers, and IoT gateways. They offer efficient processing, extended battery life, and reduced cost compared to proprietary alternatives.

2. Smartphones and Mobile Devices:

Major tech companies are exploring RISC-V for smartphones and tablets, seeking to break away from reliance on ARM architectures. RISC-V's openness, customizability, and potential performance benefits make it an attractive option for mobile devices.

3. Aerospace and Defense:

RISC-V's flexibility, security, and potential radiation tolerance make it appealing for aerospace and defense applications. It's being explored for use in satellites, avionics systems, and unmanned vehicles.

4. Education and Research:

RISC-V's open-source nature and simplicity make it an excellent platform for teaching computer architecture and processor design. Universities and research institutions are actively using RISC-V for educational and research purposes.

BIG NAMES JOIN THE RISC-V REVOLUTION!

Now, let's look at some of the companies that have started adopting RISC-V.

RISC-V, the open-source processor architecture, is no longer just a techie's whisper. Big names like Microchip, Western Digital, and even Intel are starting to sing its praises. Forget silicon valleys, RISC-V is climbing corporate mountains, and here's why:

1. **Microchip:** This embedded control giant isn't sitting on its chips. They've embraced RISC-V with their Icicle Kit, a development tool paving the way for custom-built processors. Think Legos for engineers, but with circuits instead of bricks!
2. **Western Digital:** From hard drives to flash drives, Western Digital stores our data. Now, they're storing their hopes on RISC-V. By integrating it into their non-volatile devices, they're betting on its flexibility and performance boost.
3. **Intel:** The chip king himself is cautiously dipping his toes into the RISC-V pool. While still heavily invested in their own x86 architecture, Intel recognizes the potential of this open-source challenger. Who knows, maybe one day our laptops will hum to the tune of RISC-V.

RISC-V FUELS INDIA'S SEMICONDUCTOR AMBITIONS

RISC-V is making big waves in India, with the potential to be a game-changer for the country's tech scene.

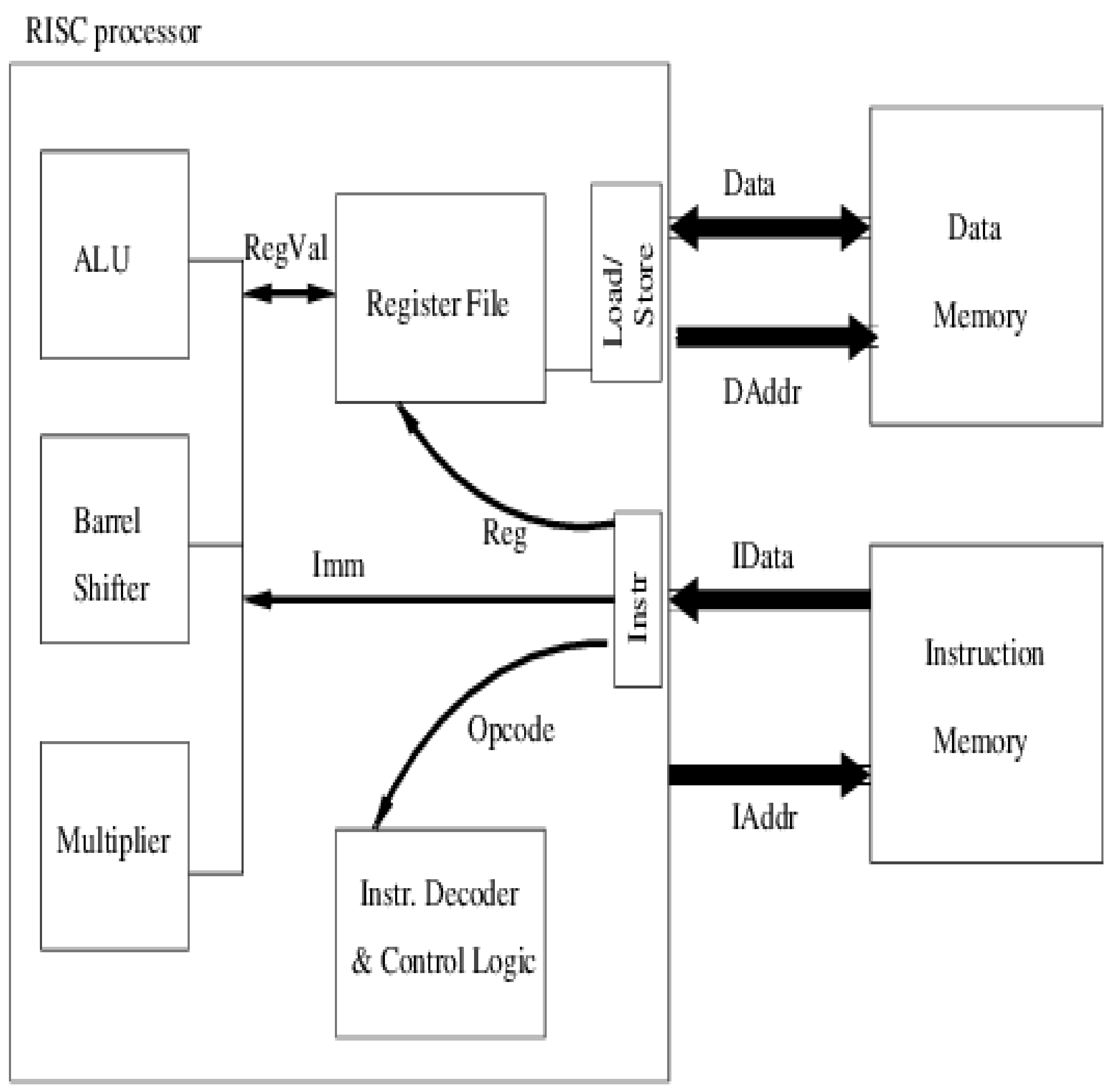
Why is it important for India?

India heavily relies on imported semiconductors, making it vulnerable to supply chain disruptions and geopolitical tensions. RISC-V offers a path towards self-reliance in chip design, boosting domestic innovation and creating new opportunities in sectors.

The Indian government's push:

Recognizing the potential, the Indian government launched the Digital India RISC-V (DIR-V) program in 2022. This ambitious initiative aims to:

- Develop indigenous RISC-V processors like SHAKTI and VEGA.
- Foster a RISC-V ecosystem with startups, academia, and research institutions.
- Create a "Made in India" supply chain for RISC-V chips.

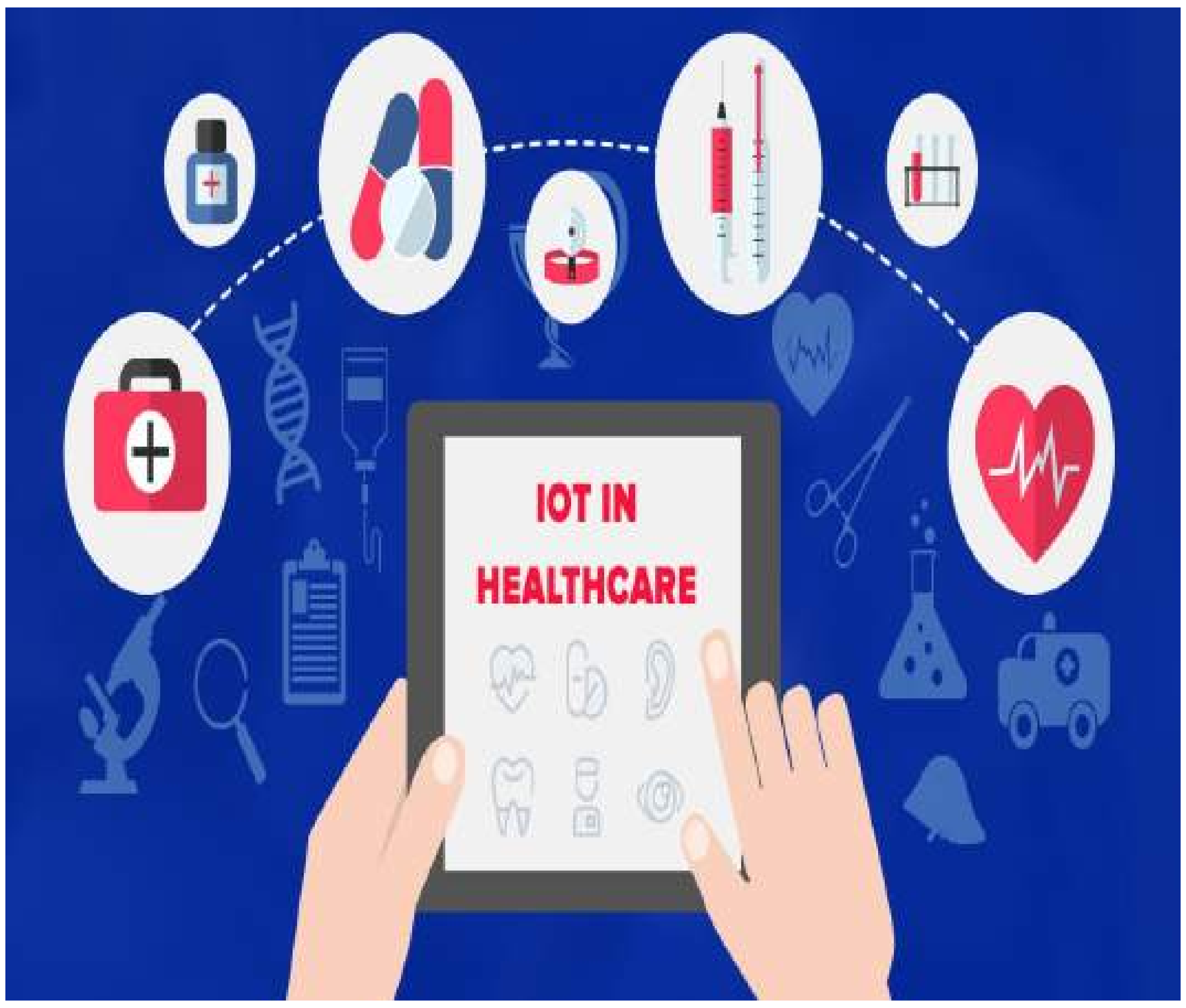


FINAL THOUGHTS

RISC-V, an open-source instruction set architecture (ISA), offers promising potential due to its modularity, scalability, and open design, fostering innovation and customization in processor development. While the future looks bright, challenges remain. Building a robust RISC-V ecosystem takes time and investment. India needs to attract talent, create a supportive infrastructure, and overcome existing dependencies on foreign technology. Despite these hurdles, RISC-V presents a unique opportunity for India to leapfrog in the global tech race. With continued government backing and a thriving ecosystem, RISC-V could be the key to unlocking India's chip design potential and propelling the country towards a more secure and self-reliant tech future.

~T Sivachidambaram,III year

UNLEASHING THE POWER OF IOTs IN HEALTHCARE



The everyday challenges we face from our aging population with multiple chronic illnesses are ubiquitous worldwide. The medical, lifestyle, and personal health needs of aging populations will continue to burden our healthcare resources. Fulfilling these challenges requires a focus on empowering populations to self-manage their health through health innovation to improve well-being and attenuate health resource burden. This is where the IoT (Internet Of Things) comes into the picture.

WHAT IS IOT AND WHY HEALTHCARE?

The Internet of Things (IoT) is a system of wireless, interrelated, and connected digital devices that can collect, send, and store data over a network without requiring human-to-human or human-to-computer interaction. It promises many benefits to streamlining and enhancing our healthcare delivery to proactively foresee health issues and diagnose, treat, and monitor patients both in and out of the hospital.

IoTs have been a topic of global interest over a couple of decades. However, the healthcare industry has just begun to understand its tremendous potential and usefulness. IoTs have recalibrated the healthcare industry with their endless applications in the structure. The enactment of IoT in healthcare started with its adoption of remote patient monitoring for the retraction of data from bedside devices which can help physicians and nurses make better medical decisions and reduce human interactions, thereby eliminating error rates. In response to the novel COVID-19 pandemic, many government leaders and decision-makers are implementing policies to deliver healthcare services using this technology and it is now becoming increasingly important to understand how established and emerging IoT technologies can support health systems to deliver safe and effective care.

WHY ARE IOTS SUCH A BIG DEAL IN HEALTHCARE?

Well, for all the purposes and requirements, IoTs have just begun to pave their path and are employed as a practice among doctors and patients, changing the conventional way of treating illness. With the increase in the global population, the number of chronic diseases, and costlier services, the healthcare industry has long lost hope. To its rescue came the IoTs in the form of X-rays, followed by patient monitoring units and then Hospital meters which will reduce the major workload with operations and patient care.

IoTs in healthcare have been embedded with current procedures, mainly with context to remotely monitoring patients in real-time, collecting data, and transferring them to end connectivity, which assists patient flow automation and enables data movement, vital information analysis, etc. IoTs have reduced regular medical check-ups to be more patient and home-centric than hospital-centric approaches. They are making health care much more efficient and avaricious by equipping objects with sensors to monitor their external environment.

WHAT DOES AN IOT DRIVEN FUTURE LOOK LIKE FOR HEALTHCARE?

The revolutionary futuristic IoTs are on their way to marking their footprints with the help of breakthrough innovations and ideas. Some of the highly anticipated advancements include upgrades in sensor technologies, improvements in systems to gather and process data, and integration of artificial intelligence technologies in healthcare.

In terms of improving the existing implementations, research studies are in progress to enhance the usability and connectivity capabilities required in various areas of healthcare. Low-power operation is one of the essential characteristics focused on by researchers who are trying to utilize energy-harvesting systems with the help of ultra-low-power voltage converters. Moreover, the rise of artificial intelligence (AI) and its alliance with IoT is one of the critical aspects of digital transformation in modern healthcare. AI, along with sensor technologies from IoT, can lead to better decision-making. Advances in connectivity through artificial intelligence are expected to promote an understanding of therapy and enable preventive care that promises a better future.

CHALLENGES FACED WHILE IMPLEMENTING IOT IN HEALTHCARE

With all these advantages and booming hands in the healthcare industry, IoTs do face challenges in healthcare. These new technologies, in spite of their immense potential to change the healthcare model, have specific difficulties associated with their practical implementation. Major fear revolves around the generation of tremendous data through a high number of devices associated with the system and the threat of cyber-attacks and data breaches. Several medical organizations are still doubtful or majorly cautious about proceeding with these systems. Solutions for data scalability and protection through cybersecurity would address the critical nature of IoT in healthcare, boosting its applications and adoption rates in the future.

In conclusion, IoT applications are a growing area of research in healthcare. There are limitless predictions about the revolution that can be brought through these IOTs in healthcare by improving the quality of healthcare and dramatically reducing healthcare costs. With a closer look at technical aspects, IoT's full usage is yet to be explored in healthcare. It is expected to bloom and overcome its challenges to revolutionize the conventional healthcare models of the future.

~Akshaya SR,III year

ULTRA HIGH VOLTAGE DIRECT CURRENT (UHVDC)

An era of soaring energy demands and decarbonized energy systems calls for efficient and economical power transmission. Hence, Ultra High Voltage Direct current (UHVDC) have emerged as a transformative solution for long-distance power transmission, reshaping the landscape of electrical grids. UHVDC systems can operate at voltages beyond the conventional limits, and their ability to transport electricity across vast distances with minimal losses makes them indispensable in a future that strives for sustainability.

At its core, UHVDC converts alternating current (AC) to direct current (DC) at the transmitting end using high-power electronic devices like thyristors or Insulated Gate Bipolar Transistors (IGBTs). The direct current is then transmitted over long distances with minimal losses. At the receiving end, the DC is converted back to AC for distribution to the grid.

AC lines have been the standard for decades due to the ease at which high voltages can be converted to low voltages depending on demand. Its disadvantage lies in that a sizable proportion of power is consumed in alternating the current. For any given voltage, an AC system has roughly double the losses of a DC system.

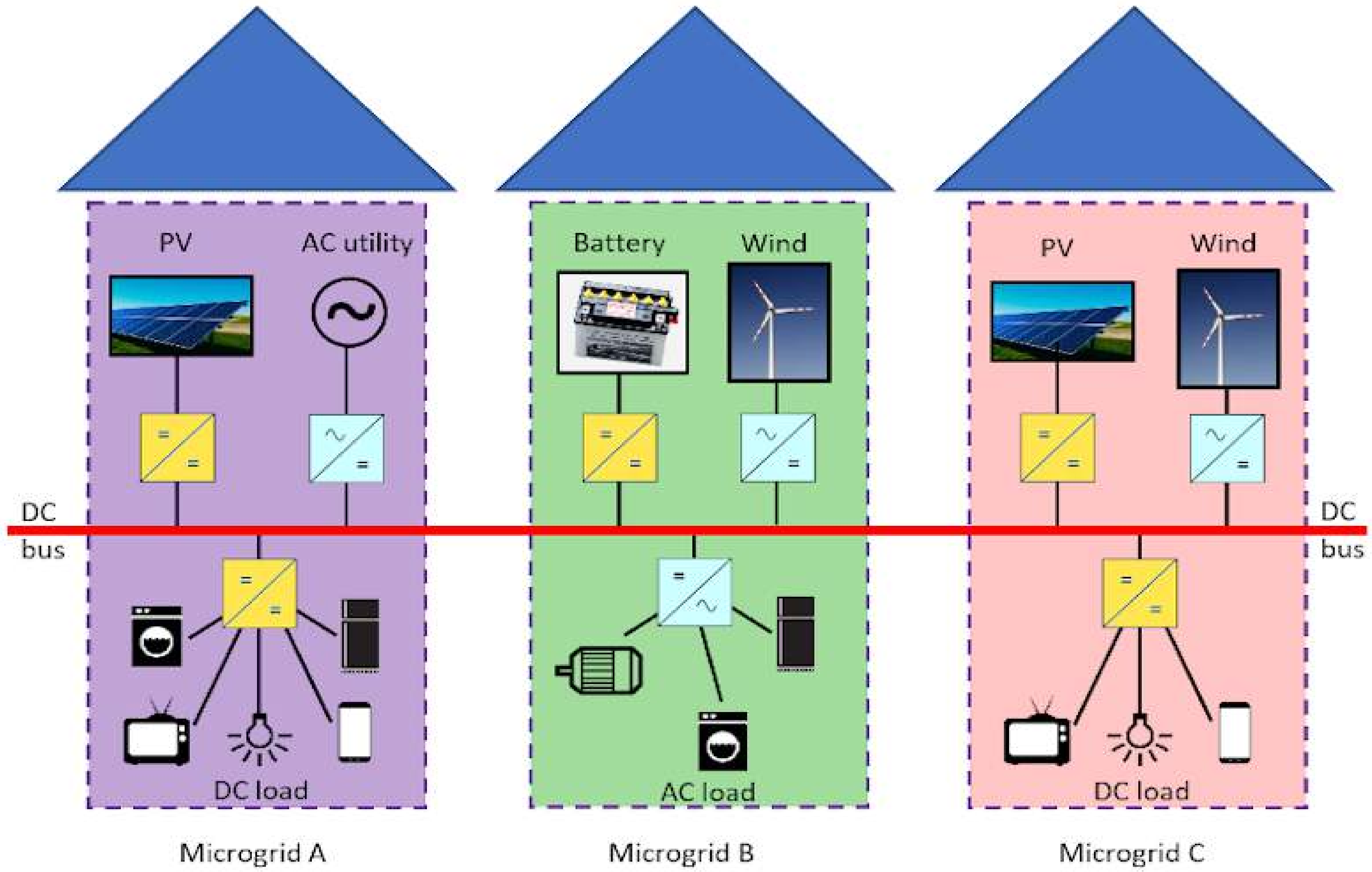
UHVDC systems use fewer materials than AC, as they require three slightly larger wires, while AC systems use six conducting wires. DC systems also need less aluminium and, hence, carry less weight. It also enhances grid stability through advanced control mechanisms and stabilizes heavily strained AC grids. The technology allows for dynamic power flow control, providing flexibility and strength in managing the electrical grid. It facilitates efficient electricity sharing between regions, optimizing global energy resources. This capability is crucial for harnessing renewable energy from remote locations and delivering it to high-demand areas. Hence, an interconnected power system is established across regions and countries.

While UHVDC systems require substantial initial investments, their lower transmission losses contribute to reduced environmental impact over the long term. The efficiency gains align with global efforts to create more sustainable and resilient energy infrastructures.

In 2010, China became the first country to adopt UHVDC to meet the relentless demand for electricity. UHVDC can provide up to 10 gigawatts to power nearly 20 million Chinese homes. The growing efficient grid in China proves that the best places for UHVDC to take root are the bigger countries that are capable of generating large amounts of power and need to deliver it to cities over great distances.

~Sreya Deepa,III year

DC MICROGRID: THE FUTURE OF POWER TRANSMISSION



In an age where energy efficiency and sustainability are paramount, the traditional realm of power transmission is undergoing a significant evolution. Enter Direct Current MicroGrids - an innovative solution poised to reshape how we generate, distribute, and consume electricity. As the global demand for power rises, the need for advanced systems to navigate the complexities of our changing energy landscape becomes increasingly apparent. DC MicroGrid technology is a transformative approach to power transmission.

Microgrids are localised, small-scale energy systems that can function separately and collaborate with the larger power grid. They comprise a network of dispersed energy resources, including conventional generators, energy storage devices like batteries, and renewable energy sources like solar and wind turbines. Microgrids' primary feature is their capacity to produce and distribute electricity locally, supplying power to a particular region, neighbourhood, or establishment.

They can function independently or synchronise with the main grid, depending on particular requirements and conditions. They provide a more adaptable and robust energy distribution method, enabling greater efficiency and dependability and incorporating renewable energy sources into the whole energy mix.

As the renewable energy revolution gains momentum, a new player emerges, poised to disrupt the established order: the DC microgrid. Unlike its AC cousin, burdened by conversion losses and cumbersome synchronisation, the DC microgrid thrives on simplicity and efficiency. Its main structure revolves around a central DC bus; DC bus voltage is maintained by supercapacitors, which act as sinks and sources as required; DC bus directly links diverse renewable sources like solar panels and wind turbines to energy storage units and local loads. This eliminates the need for AC-DC conversions, maximising energy capture and minimising wasted watts. DC systems have inherent stability characteristics, simplify control and protection mechanisms, and can utilise smaller conductors and transformers due to lower transmission losses. This elegant design makes DC microgrids ideal partners for renewables, seamlessly accepting their native DC output and readily integrating them into the grid. Whether powering remote communities or bustling urban centres, these decentralised energy islands promise a future teeming with clean, efficient, and resilient power.

KEY COMPONENTS OF DC MICROGRIDS

1. Distributed Energy Resources

- Photovoltaic Panel: A primary source of clean

- energy, directly converting sunlight to DC electricity.
- Wind turbines: Generate DC power through the rotation of blades, requiring conversion to AC for grid integration but suitable for DC microgrids.
- Fuel cells: Convert chemical energy (hydrogen, natural gas) into electricity and heat, often producing DC power directly.
- Hydropower: Utilises water flow to generate electricity, typically in small-scale installations suitable for DC microgrids.

2. Energy storage systems

- Batteries: Store electrical energy for later use, providing grid stability and smoothing out intermittent renewable generation.
- Supercapacitors: Offer high power density for rapid charging and discharging, suitable for frequent power fluctuations and bus voltage maintenance.

3.Power Electronics Converters

- Bidirectional DC-DC converters: Interface between different DC voltage levels, enabling power flow between Distributed energy resources, storage, and loads.
- DC-AC converters (inverters): Allow DC microgrids to connect to the primary AC grid for additional power or export excess generation.

4.Microgrid Control System

- Centralised or distributed controllers: Monitor and manage power flow, voltage, and frequency within the microgrid, ensuring stable operation.
- Communication infrastructure: Enables data exchange between microgrid components for coordinated control and decision-making.

5.Protection System

- Circuit breakers and fault detection mechanisms: Protect equipment and personnel from electrical faults and overcurrents.
- Islanding protection: Safely disconnects the microgrid from the main grid during outages, ensuring autonomous operation.

CASE STUDY: THE RAUMA MICROGRID - DC POWERING A FINNISH ISLAND

Context: Rauma(Image 1), a charming harbour town nestled on the southwestern coast of Finland, faced a power supply dilemma. Its remote location on an island made grid extension costly and unreliable. Additionally, the historic town centre, with its narrow streets and wooden buildings, posed challenges for traditional AC infrastructure upgrades. In 2016, Rauma embraced a pioneering solution: a DC microgrid. Built around a 50 kW photovoltaic (PV) plant on the harbour roof, the system boasts 1 MWh of battery storage and serves several iconic buildings, including the Town Hall and Maritime Museum.

POWERING THE FUTURE BUT NOT WITHOUT CHALLENGES:

- High Initial Investment: Building new DC infrastructure can be more expensive than traditional grid extensions.
- Compatibility Issues: Integrating existing AC equipment with DC systems requires careful planning and modification.
- Grid Interconnection: Seamless integration with the main grid for surplus energy export requires sophisticated technology.
- Scalability Concerns: There is a need to address concerns about expanding DC microgrids to power larger areas.

CONCLUSION

In conclusion, DC microgrids stand at a pivotal crossroads. While their potential to reshape the energy landscape is undeniable, overcoming obstacles will require unwavering commitment and collaboration. By addressing technological challenges, fostering standardisation, incentivising investment, and engaging communities, we can unlock the transformative power of DC microgrids. As we navigate the complexities of energy transition, DC microgrids offer a beacon of hope—a pathway towards a more resilient, sustainable, and equitable energy future. The time to embrace this potential is now, and the collective efforts of industry leaders, policymakers, and communities will be instrumental in realising the promise of a world powered by localised, efficient, and adaptable DC microgrids.

~Manush Patel,III year

IMAGE 1

~Diya S Dileep,III year
~Tejasvini G,Karthik,Yashvi Chauhan,II year

DID YOU KNOW?

Did you know that the microwave oven was invented by accident? A scientist working with radar technology noticed his chocolate bar melted when he stood in front of an active radar magnetron. This led to the development of the microwave oven, revolutionising cooking with electromagnetic radiation.

DID YOU KNOW?

The invention of the transistor, a fundamental building block of modern electronics, was the result of research into semiconductors. While attempting to amplify electrical signals with semiconductors, scientists at Bell Labs accidentally discovered the transistor effect in 1947, paving the way for the development of smaller, more efficient electronic devices.

DID YOU KNOW?

LEDs, which are now widely used for lighting, displays, and indicators, were initially discovered as a side effect of experimenting with diodes in the early 1960s. Nick Holonyak Jr., a researcher at General Electric, inadvertently created the first visible-spectrum LED while investigating semiconductor materials for infrared communication.

DID YOU KNOW?

Electronic tattoos, also known as e-tattoos or epidermal electronics, are thin, flexible electronic devices that adhere to the skin like temporary tattoos. These devices can monitor various physiological parameters such as heart rate, temperature, and muscle activity, providing continuous health monitoring without the need for bulky wearable devices.

DID YOU KNOW?

The Edison effect, discovered by Thomas Edison in the late 19th century, refers to the emission of electrons from a heated filament in a vacuum tube. This phenomenon laid the foundation for the development of vacuum tubes and later, electron tubes, which were crucial components in early electronic devices such as radios and televisions.

DID YOU KNOW?

Tesla's induction motor, a revolutionary 1888 invention, addressed the shortcomings of commutators. By eliminating the need for commutators, Tesla's design was able to overcome the issues like frictional energy losses and mechanical complexity posed by commutators. This technical innovation allowed for scalability and versatility, paving the way for widespread adoption in various applications, from household devices to industrial machinery.

DID YOU KNOW?

In 1901, Hubert Cecil Booth, a British engineer, attended a demonstration featuring a dust-blowing device at a carnival. Inspired by the concept but dissatisfied with its inefficiency, Booth conceived the idea of reversing the process to create a suction-based cleaning device. The result was the electric vacuum cleaner, a breakthrough in household cleaning.

DID YOU KNOW?

India's power grid is like a grand Bollywood production, choreographing a billion electrons to dance harmoniously across mountains, deserts, and bustling cities. On April 17, 2020, India achieved a remarkable feat: the entire nation experienced a uniform power frequency, indicating seamless coordination across diverse regions and electrical loads—an unprecedented accomplishment in large-scale grid management.

DID YOU KNOW?

Jack Kilby, a brilliant engineer at Texas Instruments, changed the course of electronics forever. Facing a summer without colleagues, in 1954, he conceived the idea of an integrated circuit, a single chip that could perform multiple functions. His solo innovation paved the way for the digital age, revolutionizing electronics and earning Kilby the Nobel Prize in Physics in 2000.

DID YOU KNOW?

In 1922, Stephen Poplawski, an American inventor, accidentally crafted the electric blender while tinkering with a device for malted milkshakes. By affixing a spinning blade to a container powered by an electric motor, he unwittingly pioneered the electric blender. This happenstance invention transformed culinary practices, offering a versatile tool for blending and forever altering the landscape of kitchen appliances.

QUALCOMM

I did my internship in Qualcomm India Pvt. Ltd. during the summer of 2023. I got this opportunity through the Training and Placement Department of NIT, Trichy. The process basically consisted of resume shortlisting, an OT and a couple of interviews. The Online Test had questions related to C programming, Digital Electronics, Static Timing Analysis and Computer Organisation and Architecture. There were 2 interviews after the online test, of which one was a purely technical interview, and the other one was technical + HR. In both the interviews, my knowledge on C, Verilog, basic digital electronics and Static timing analysis was tested, after which few HR questions were asked.

At Qualcomm, I was part of the SOC Design Verification team, where our primary role is to verify various blocks that are designed. I was asked to learn SystemVerilog and Python to do the project I was allotted. My project was to develop a code that automatically verifies connection between GPIO pins connected between various blocks of the SOC.

I mostly spent my leisure time by socializing with people from different teams and playing various indoor games. I also tried learning the internal architecture of the chips that they were designing at that point of time.

If anyone is interested in the domain of Digital Electronics, they should ensure that they have a clear understanding of basic Digital Electronics, Static Timing Analysis and Verilog. Then focus on VLSI and other domain specific topics like Cache, SRAM, DRAM, etc. Above all these things, try to do a project or an intern in digital electronics or Verilog to make a strong resume in this domain.

The key part of this preparation is understanding basics thoroughly, once you have strong basics, any project can be handled with ease.

~AMRUTH

FRACTAL ANALYTICS

I worked as an Imagineer Intern at Fractal Analytics. I got the opportunity through the Training and Placement Department of NIT Trichy. After attending an online assessment and two rounds of interviews, I, along with 10 other people secured this opportunity to work with Fractal. We were each assigned to different teams based on our experiences. I was assigned to work with the Cloud and Data Tech team.

I was engaged with a project titled “CDT tools”. We were tasked with developing software development kits (SDKs) and packages which would ease the development process within the Cloud and Data Tech (CDT) team. The internship lasted for a total of eight weeks and it was completely online. During the first four weeks I worked on developing ReactJS components, and converting them into private GitLab packages which can be downloaded by anyone within the organization. The next two weeks were focused on developing SDKs to upload files to Cloud Service Providers like AWS (Amazon Web Services) S3, Azure Blob Storage and GCS (Google Cloud Storage). And the last two weeks were focused on developing a documentation application showcasing all the developments made, along with their respective tutorials.

~ KARTHIK NARAYAN V V

NVIDIA

I did my internship in Nvidia, Bangalore. I have started my preparation for the online assessments and interviews, by first giving importance to all the basic concepts in digital electronics and I made sure to practice enough problems.

During the course of the internship, I was part of the System Performance Verification team (SoC perf verification) for the Tegra T264 chip under architecture department.

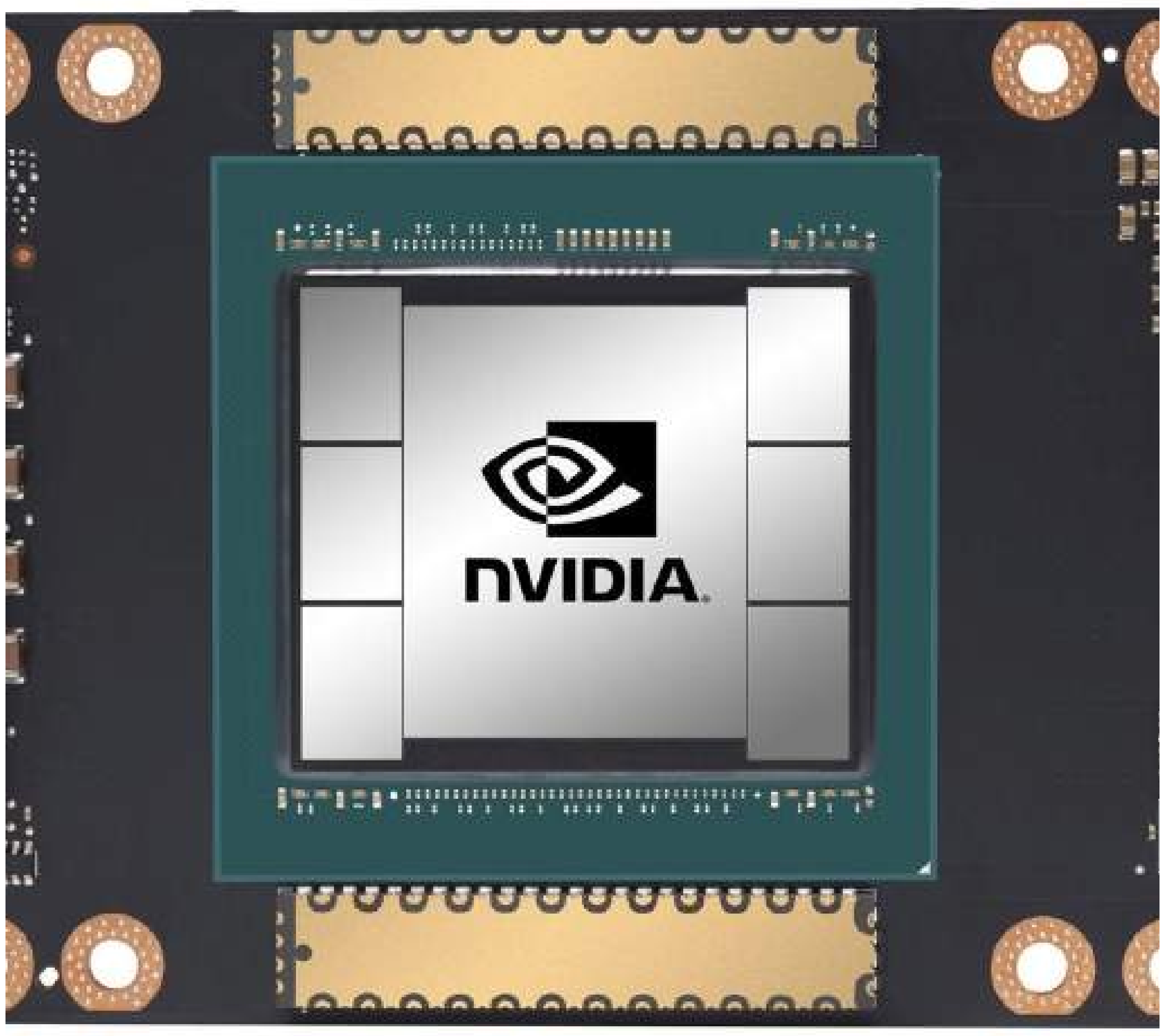
My work was to comprehend the previous work and apply the use-cases to implement Producer-Consumer relationship. I worked on languages like Perl, Python and System C. Through the internship, I attained a lot of technical insights about navigating a corporate world. I was very satisfied with the project I worked on and had a lot of fun.

As I was working on a major project, I dedicated significant time to learning and grasping the initial concepts. I also thoroughly enjoyed my time exploring a lot of places in Bangalore.

Initially, I was clueless about the internship process and the preparation that it required, but I received valuable guidance from my seniors.

My advice to juniors is to discern your career aspirations, envision your final goal and work towards it consistently. View internships and job opportunities as just small milestones towards your goal. Strive for excellence and work for it.

~HARINI M



JOHN DEERE

I have done my internship in John Deere under the Embedded software development department. The process consisted of PPT, OT and an interview which consisted of both Technical and HR.

I worked on design and implementation of Hybrid Drive Controller, focusing on Power Management Control Strategies for Enhanced Performance where I had to develop various control algorithms for PMC of Series Hybrid Drive. Subsequently, I had to test and analyze the outputs to discern the most suitable algorithm aligning with our Project Objectives.

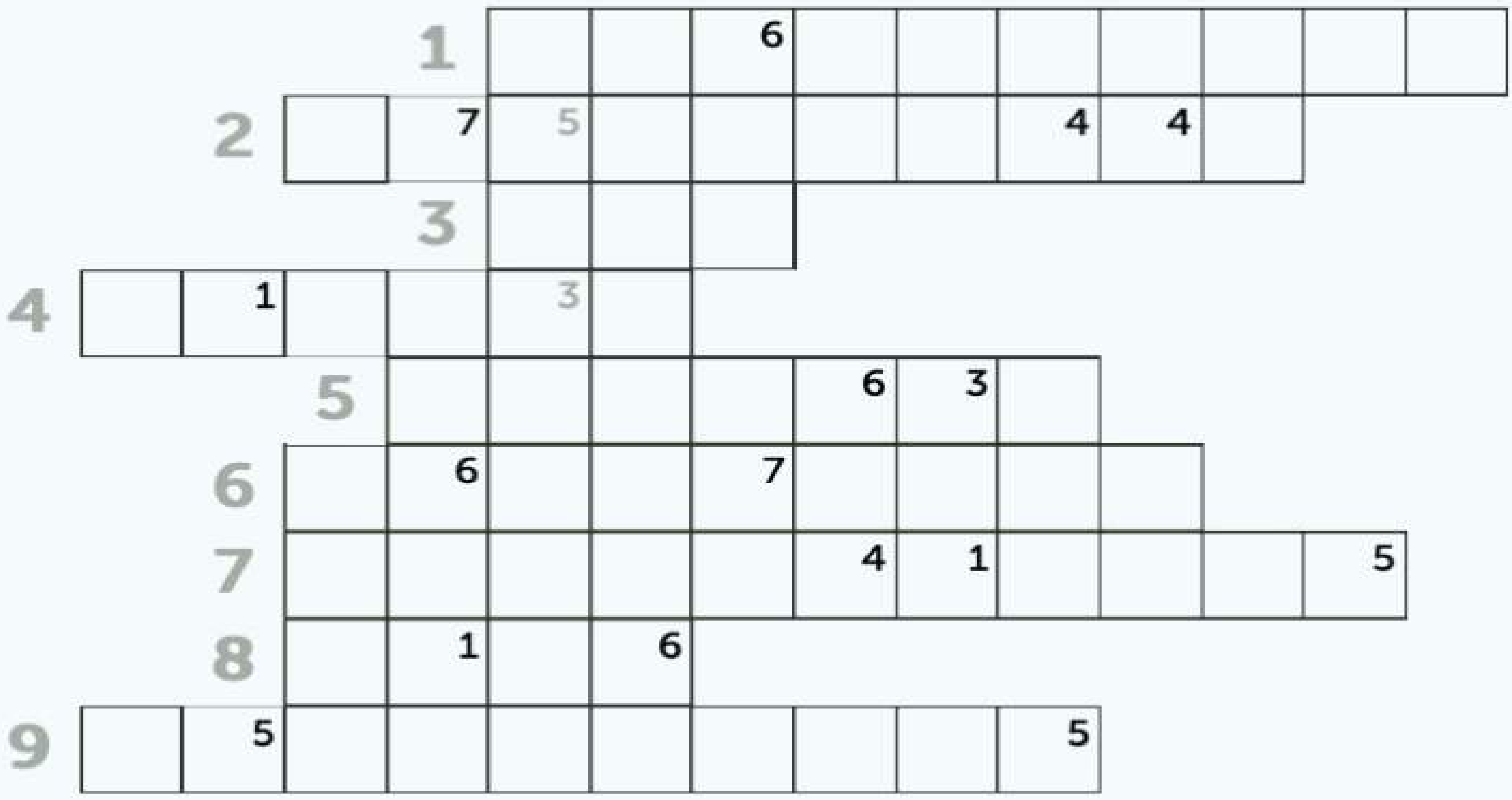
I went trekking with my friends and explored the lands of Pune. We also spent time in malls and watched movies.

My first preference was the electrical domain. Firstly, learn the basic electrical topics, especially machines and power systems. Then give priority to power electronics and control systems. Make sure to be thorough with all the projects in your resume and the concepts involved.

~HARIHARAN

CROSSWORD

~KANCHANA,II year



1 An automatic control device designed to be responsive to temperature and typically used to maintain set temperatures.

2 _______ voltage law states that voltage across a closed loop is equal to the sum of voltage drops within the loop.

3 SI unit for the opposition faced by current in a circuit

4 Process of adding impurities to intrinsic semiconductor to improve conductivity

5 SI unit of electric conductance

6 A circuit that converts AC to DC

7 A device that steps-up or steps-down AC voltage

8 Points on the induction motor where the magnetic field is the strongest

9 Device that is typically used for switching operations

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T Sivachidambaram　Akshaya　Sreya Deepa


Tejasvini G　Kanchana



Diksha　Yashvi Chauhan　Karthik