









# IEEE SIESGST PRESENTS



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### **ABOUT SIES**

The South Indian Education Society (SIES) was established in 1932, the South Indian Education Society (SIES) has been a pioneer in education, knowledge, and learning in Mumbai. For over nine decades, SIES has remained dedicated to delivering quality, value-based education, catering to students from nursery to doctoral levels across a wide range of disciplines. The society's mission nurturing focuses critical thinking, on fostering practical skills, and bridging the gap between theory and practice through extensive field experiences.

"This society should sincerely serve the cause of education and the educational needs of the common man of this cosmopolitan city"

- SIES MISSION

(Set by our Founder Shri M. V. Venkateshwaran in 1932)

"To be a centre of excellence in Education and Technology committed towards Socio-Economic advancement of the country"

- SIESGST VISION



SIES Graduate School of Technology, an this well-established integral part of community, started in the year 2002 and is located in the list of educational hubs in Navi Mumbai imparting quality based technical education, offering a four-year Bachelor of Engineering degree courses in Electronics and Telecommunication Engineering, Electronics & Computer Science, Computer Engineering, Computer Science & Engineering (Internet Of Things and Cyber Security Including Block Chain Technology), Artificial Intelligence & Data Science, Artificial Intelligence & Machine Learning, Information Technology and Mechanical Engineering.

In addition to undergraduate courses, SIES GST provides postgraduate programs in Artificial Intelligence and Data Science and Information Security, addressing the evergrowing demands of the technological world.

SIES GST is recognized for its commitment to academic excellence, supported by a team of highly qualified faculty who are dedicated to shaping young minds. The institution continues to strive toward enlightening its students, fostering innovation, and inspiring them to reach their full potential in a rapidly evolving global landscape.

### ABOUT IEEE SIESGST



The illustrious IEEE Student Chapter at SIES Graduate School of Technology (SIESGST) commenced its remarkable journey in 2006. Nestled within the esteemed grounds of SIESGST, the chapter has grown to become one of the most distinguished student bodies within the institution. Over the years, IEEE SIES GST has unwaveringly pursued its mission of fostering intellectual brilliance and creating an environment that promotes holistic personal and professional development for every individual who becomes a part of its thriving community.

With a vision to inspire young minds and keep them abreast of the latest technological advancements, IEEE SIESGST organizes a plethora of contemporary workshops and events. These initiatives are designed to empower students with cutting-edge knowledge and practical skills in transformative fields such as Data Analytics, Cybersecurity, 6G, UI/UX design, LoRaWAN, and many more. By participating in these workshops, students not only gain technical expertise but also develop the confidence to innovate and contribute meaningfully to the technological landscape.

The pinnacle of IEEE SIESGST's annual celebrated national-level activities is its technical festival. "Techopedia." With immense pride and enthusiasm, the chapter organizes this grand event, which has become a cornerstone of its legacy. In its eleventh edition, Techopedia XIII stood as a testament to the chapter's relentless commitment to excellence. Each vear. festival the is rejuvenated by the fresh perspectives and unique talents of the organizing committee, whose ingenuity continues to elevate the quality and scale of the event. Built on a solid foundation of tradition and innovation, Techopedia has grown exponentially, offering a

vibrant platform for showcasing technical prowess, creativity, and collaboration.

Techopedia is more than just a festival; it is a celebration of knowledge, innovation, and camaraderie. attracts enthusiastic lt participants not only from SIESGST but also from colleges across Mumbai, Navi Mumbai, and beyond, uniting young minds from all over India. The festival features a wide array of technical and non-technical events, ensuring there is something for everyone. From thoughtcompetitions and interactive provoking workshops to engaging panel discussions and hands-on experiences, Techopedia fosters an atmosphere of learning and inspiration.

The outstanding winners of Techopedia's diverse events are recognized for their achievements with impressive rewards, including substantial cash prizes, meticulously designed certificates, and prestigious medals. These tokens of appreciation serve as a testament to the participants' hard work, creativity, and determination.

IEEE SIESGST remains steadfast in its mission to nurture future leaders, innovators, and visionaries. By providing opportunities for students to explore, experiment, and excel, the chapter continues to leave an indelible mark on the lives of its members and the broader academic and professional communities.

IEEE SIESGST extends heartfelt gratitude to our esteemed Principal, Dr. K Lakshmi Sudha, the respected HOD of EXTC, Dr. Preeti Hemnani, our wise Branch Counselor, Prof. Biju Balakrishnan, WiE incharge Prof. Vaishali Mangrulkar and the entire pantheon of our beloved student chapter, whose ceaseless dedication and unwavering efforts have propelled the glorious progress of IEEE SIESGST to soaring heights of excellence.

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### FROM THE DESK OF OUR BRANCH COUNSELOR

I am delighted to present to you the 9th edition of 'TECHNOZINE', the annual technical magazine of IEEE SIESGST. As the branch counselor, I have had the privilege of closely observing the growth, dedication, and innovation within our student branch. Each year brings new challenges and opportunities, and my goal remains to nurture curiosity, creativity, and technical excellence among our students.

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Through a diverse range of activitiessymposiums, industry webinars, and STEM lectures-our committee has consistently strived to push boundaries. The Women in Engineering (WiE) Affinity Group has taken commendable initiatives through STEM lectures, while the Computer Society (CS) Chapter has organized insightful webinars that have greatly benefited students. While we celebrate our our achievements, we also recognize that growth is a continuous journey, and there is always room for improvement. As members of the IEEE family, I am confident that we will keep evolving, setting new benchmarks of excellence.

'TECHNOZINE' stands as a testament to the dedication and collaborative spirit of our IEEE SIESGST community. It highlights the successes of our flagship events, from the grand three-day symposium 'EPSILON' to the much-anticipated 'TECHOPEDIA 13.0'. Additionally, it features technical articles authored by our students, showcasing their knowledge, skills, and passion for technology.

None of these achievements would have been possible without the unwavering support of our esteemed advisor, Dr. P. V. Parameswaran, our Principal, Dr. K. Lakshmi Sudha, and our HOD, Dr. Preeti Hemnani. Their guidance has been instrumental in shaping the success of IEEE SIESGST.

As we step into another exciting year of learning and innovation, I extend my best wishes to every student. May you continue to explore, innovate, and excel in all your endeavors.

> ~Prof. Biju Balakrishnan IEEE Branch Counselor, CS, and MTT-S Chapter Advisor IEEE SIESGST

### **IEEE CHAIRPERSON**



Looking back now, with all the decisions taken in these four years, the wisest and happiest decision was to join IEEE SIESGST. From the day of my interview for editorial volunteer to the present, this organization has never stopped teaching me valuable lessons.

My journey began as an Editorial Volunteer, which challenged my introverted nature and completely changed my perspective towards my personal and professional life. This phase ultimately strengthened my bond with IEEE SIESGST. As I was then promoted to the position of Joint-Secretary, it certainly boosted my confidence and gave me an opportunity to master my skills with the help of teamwork.

When I was elected as the Chairperson, I initially felt a bit nervous about the responsibilities entrusted to me. However, the unwavering confidence my seniors had in their decision, combined with the heartfelt support and encouragement from my fellow council members, became my greatest source of strength. With that, I have led people with a spirit of creating and developing something together.

I'm grateful for having such a wonderful and enthusiastic batch of teammates who have constantly been there for me. From the seniors, colleagues to juniors, everyone has either inspired me or taught me a valuable lesson, which I will gladly cherish and pass on. The guidance and unwavering support from our Branch Counselor, Prof. Biju Balakrishnan, and WiE Incharge Prof. Vaishali Mangrulkar have been instrumental in our success. Their has mentorship shaped generations of achievers, and I am proud to count myself among them.

IEEE SIESGST is renowned for its vibrant activities and its consistent ability to deliver outstanding events. Achieving this level of excellence year after year is no easy feat, yet our team has managed to uphold this standard, earning accolades such as the Exemplary Student Branch award at the IEEE R10 Awards for three consecutive years and the Best MTTs Chapter Award.

As one of the oldest student branches in our institution, IEEE SIESGST stands on the foundation laid by countless individuals who have contributed to its legacy. Its current success is the result of years of dedication and effort, and I feel privileged to have been a witness and contributor to its growth. I have always believed that IEEE SIES GST is not merely a team; it is a FAMILY with legacy. A legacy that future generations will carry forward with the same sense of responsibility and pride that my team and I have upheld. It is deeply fulfilling to know that we have played our part in continuing this legacy, ensuring that the accomplishments and values of IEEE SIES GST will inspire and guide those who come after us

> ~Aditi Kurhekar IEEE Chairperson,2024

### **IEEE REPRESENTATIVE**



Looking back on the last three years, I can certainly state that joining IEEE SIESGST was one of the most fulfilling and meaningful decisions I've made. This organization has been a cornerstone of my personal and professional development, from my first involvement as an Event Volunteer to my current position as an IEEE Representative.

My journey began as an Event Volunteer, a role that challenged me in ways I had never imagined. It pushed me beyond my comfort zone, enhancing my organizational and communication skills. Being part of a dynamic team that orchestrated numerous technical and professional events instilled in me a deep sense of responsibility and teamwork. These experiences cemented my connection with IEEE SIESGST and inspired me to take on more significant roles.

As I advanced to the position of Admin Head, my leadership style and outlook evolved significantly. This role required strategic planning, coordination, and problem-solving, all of which helped me refine my management skills. Leading a team through various events and initiatives provided valuable insights into administration and collaboration, reinforcing my ability to tackle challenges with confidence and efficiency.

Taking on the role of IEEE Representative was both a privilege and a challenge. Initially, the responsibility felt overwhelming, but the unwavering trust of my seniors and the support of my peers became my greatest source of strength. I embraced the role with a vision of fostering collaboration and upholding the esteemed legacy of IEEE SIESGST. Working alongside a passionate and dedicated team made this journey even more fulfilling, as each member contributed to the organization's continued growth and success.

IEEE SIESGST has consistently been a leader in organizing impactful events, workshops, and technical sessions. Through our collective efforts, have achieved we significant milestones, including prestigious accolades such as the Exemplary Student Branch award at the IEEE R10 Awards and the Best MTTs Chapter Award. Maintaining such high standards year after year is no small achievement, and I take immense pride in being part of a team that has contributed to this legacy.

The invaluable guidance and mentorship of our Branch Counselor, Prof. Biju Balakrishnan, and WiE Incharge, Prof. Vaishali Mangrulkar, have played a crucial role in our journey. Their wisdom and encouragement have shaped countless students into capable professionals, and I am deeply grateful for their support.

IEEE SIESGST is more than just an organization it is a family built on a foundation of dedication and passion.

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### IEEE REPRESENTATIVE

Its legacy is a testament to the hard work of those who came before us, and I am honored to have played a role in continuing this tradition. As I move forward, I do so with the hope that future generations will carry this legacy forward with the same commitment and enthusiasm. This has been an extraordinary journey one that I will always cherish.

> ~Sanket Patil IEEE Representative, 2024

### **CS REPRESENTATIVE**



Joining IEEE SIESGST has been one of the wisest decisions of my college life. From starting as a volunteer to becoming the Computer Society Representative, this journey has been transformative, both personally and professionally.

My initial role as a volunteer was my first exposure to an organization that thrived on teamwork and innovation. Though I was an introverted individual at the time, working with peers on various activities helped me step out of my comfort zone. The opportunities to participate in events and contribute behind the scenes gave me a glimpse of how impactful teamwork could be. It was a stepping stone that built my confidence and showed me the of collaboration importance and open communication. Soon after, I was promoted to the position of Technical Head. This role was a turning point, as it allowed me to hone my technical expertise while also embracing the challenge of leading a team.

I learned to organize technical workshops, coordinate with various stakeholders, and manage event logistics. These responsibilities not only enhanced my leadership skills but also solidified my commitment to the organization. Working with such a dynamic team taught me how to overcome obstacles, embrace diverse perspectives, and deliver results under pressure.

Stepping into the role of Computer Society Representative brought with it immense pride and responsibility. I was entrusted with continuing the legacy of excellence that IEEE SIESGST is known for. Initially, I was apprehensive about meeting the high standards predecessors, set by my but the encouragement and unwavering support from my seniors, the the camaraderie of my peers, and the enthusiasm of my juniors kept me motivated. Together, we worked tirelessly to push boundaries, innovate, and create impactful events that resonated with the community.

IEEE SIESGST's vibrant culture and tradition of excellence have been instrumental in shaping journey. The branch my has consistently been recognized for its outstanding contributions, such as receiving the Exemplary Student Branch award at the IEEE R10 Awards and the Best MTTs Chapter Award. These achievements are a testament to the dedication and vision of every member. Being part of such a legacy is an honor, and it fills me with immense pride to have contributed to it. This journey would not have been possible without the guidance and mentorship of our Branch Counselor, Prof. Biju Balakrishnan, and WiE Incharge, Prof. Vaishali Mangrulkar. Their unwavering support, insightful advice, and encouragement have been the cornerstone of our success. They have not only guided us but also inspired us to dream big and strive for excellence. Reflecting on my time with IEEE SIESGST,

### **CS REPRESENTATIVE**

This family, built on shared goals, mutual respect, and an enduring commitment to excellence, has been a source of strength and inspiration. As one of the oldest student branches in our institution, IEEE SIESGST's legacy has been shaped by countless individuals who poured their hearts into making it what it is today. It fills me with pride and gratitude to know that I have played a role in carrying this legacy forward.

To anyone considering joining, I say this: take the leap. The experiences, skills, and relationships you gain here will shape your life in ways you cannot imagine. IEEE SIESGST is more than an organization; it is a journey of self-discovery, growth, and unparalleled learning. For me, it has been a journey of unforgettable memories, lifelong friendships, and invaluable lessons that I will cherish forever.

As I look to the future, I am confident that the spirit of IEEE SIESGST will continue to inspire and empower generations to come. It is deeply fulfilling to know that I have contributed to this legacy, and I eagerly await the achievements and milestones that future members will undoubtedly accomplish.

> ~Sahil Anjerlekar CS Representative, 2024

### MTT-S REPRESENTATIVE



My journey with IEEE SIESGST began as a Membership Department Officer, a role that marked the start of an incredible transformation in my life. My first major involvement came during Epsilon 2023, where I had the privilege of leading the Microwave Theory and Technology Society (MTTS). Within that tenure, I was also entrusted with the position of Vice Chairperson of MTTS, an achievement that bolstered my confidence and commitment to the organization. My key responsibilities spanned event planning. execution, and ensuring impactful media and publicity efforts, which became my forte over time.

One of the most challenging phases was organizing Epsilon 2023. Bringing in speakers with expertise in our domain proved to be an uphill task, as awareness about MTTS was limited. However, navigating through these difficulties and hosting a successful event taught me the art of perseverance and strategic thinking.

Among the many events I was part of, Techopedia 12 holds a special place in my heart. It was the first offline event I led, where I managed Inquisitive. The camaraderie with the team, the excitement of planning, and the thrill of executing an event of this scale were unparalleled. Successfully hosting it was not just a milestone but also a memory I will always cherish.

This year, I once again led Epsilon 2024 as the MTTS Chairperson. The incredible support from my co-team members made the event a resounding success and left me with another cherished memory. The collective efforts, teamwork, and mutual encouragement during these events shaped my perspective on collaboration and leadership.

My time at IEEE SIESGST has been instrumental in my growth, both personally and professionally. I discovered my potential as a leader and gained the confidence to take on challenging roles. The skills and values I imbibed, such as teamwork, strategic planning, and resilience, have become an integral part of my professional journey, serving me well in my career aspirations.

The relationships I built with my teammates, seniors, and juniors have been nothing short of exceptional. Each interaction helped me learn and grow, and the guidance I received enabled me to understand my true potential.

A special mention goes to Prof. Biju Balakrishnan, whose mentorship not only shaped my journey at IEEE SIESGST but also provided me with an internship opportunity that added tremendous value to my career. Both he and WiE Incharge Prof. Vaishali Mangrulkar , have been pillars of support, offering guidance and encouragement during event planning and execution.

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### MTT-S REPRESENTATIVE

This year, I was also given the opportunity to host Techopedia 13, an event I look forward to leading with the same passion and dedication.

Reflecting on my time with IEEE SIESGST fills me with immense pride and gratitude. It has been more than just an organization; it has been a family, a legacy, and a crucible of growth. As I continue this journey, I hope to contribute further and pass on the lessons I've learned to future generations.

IEEE SIESGST has transformed me into a more confident, resilient, and driven individual. For all that this organization has given me, I can only say, "Thank you for the memories, the lessons, and the opportunities." Here's to the legacy of IEEE SIESGST an ever-growing hub of excellence and inspiration.

> ~Kunal Zemse MTT-S Representative,2024

### WIE REPRESENTATIVE



In my second year, I joined IEEE as an admin volunteer. From the very first meeting, I realized this was more than iust an organization; it was a family bound by shared goals and mutual support. Planning and executing events with such a vibrant team never felt like work. Being part of the organizing committee for Techopedia that year was an eye-opening experience, as I witnessed the immense effort and coordination required to bring an event to life. This phase taught me the significance of collaboration and instilled in me a sense of belonging.

When the Junior Council forms were announced, I knew I wanted to take on a larger role. Being selected as the Vice Chairperson was both an honor and a challenge. The role demanded accountability and a knack for decision-making. Whether it was brainstorming ideas, managing logistics, or guiding the team, every responsibility became an opportunity to grow. The pride of seeing our hard work manifest in successful events, especially the flagship Techopedia, was unparalleled. It reinforced my belief in the power of teamwork and determination.

In my final year, I was entrusted with the role of Women in Engineering (WiE) Chair for 2024-2025. Leading such a dynamic group taught me the importance of inclusivity and the ability to inspire others. Together, we organized initiatives that aimed to empower and educate, creating a lasting impact. This position allowed me to refine my leadership skills while fostering an environment where everyone felt valued and motivated.

Throughout this journey, IEEE SIES GST has been a cornerstone of my growth. It has taught me resilience, leadership, and the art of collaboration. The lessons learned, the challenges overcome, and the friendships formed are the building blocks of my engineering journey. Each moment spent here has added a unique value to my life and shaped the person I am today.

As this chapter of my life concludes, my heart is filled with immense love and gratitude for everything IEEE SIES GST has given me. A special thanks to Prof. Biju Balakrishnan, whose unwavering support and guidance have been instrumental in our achievements. His mentorship has been a source of inspiration throughout my time here. To the incoming council, I leave this: embrace every challenge, celebrate every success, and most importantly,

### WIE REPRESENTATIVE

cherish the process. You are the torchbearers of a legacy built on passion and perseverance. I am confident you will take IEEE SIES GST to even greater heights. Here's to the endless possibilities ahead. Go IEEE!

> ~Harmeet Kaur WiE Representative,2024

### **IEEE SECRETARY**

Looking back at my time with IEEE SIES GST, I am amazed by how much it has shaped me not only as a professional but as an individual. What began as a simple volunteering opportunity at Techopedia 11, turned into an incredible journey that deepened my connection with the chapter and fueled my desire to take on leadership roles. Little did I know that every moment, every challenge, and every experience would mold me in ways I could never have predicted.

At the heart of it all was the sense of belonging a feeling that grew stronger as I took on each new role, from volunteer to Public Relations Head, and eventually, as Secretary. With each step, I found myself becoming more confident, more determined, and more passionate about contributing to a cause much bigger than myself. It wasn't just about events or titles; it was about the people, the shared goals, and the collective impact we had as a team.

Volunteering at Techopedia 11, was the beginning of my immersion in the world of large-scale technical events. coordinating, and ensuring that everything ran smoothly behind the scenes.

There were moments when the weight of decisions, deadlines, and expectations felt heavy. At times, I questioned whether I was doing enough or making the right choices. But as the months went by, I started to realize that the true essence of leadership wasn't about having all the answers it was about being resilient, staying grounded, and knowing that even the smallest contribution mattered.

What truly stood out to me during this time was the sense of community within the team. Though my role often placed me behind the scenes, I felt an undeniable sense of connection to every initiative, every event, and every member. There were moments when I marveled at the dedication and hard work of those around me, knowing that together we were creating something meaningful. The sense of came not fulfillment from individual accomplishments, but from the collective achievements we shared as a chapter.

Throughout this experience, I learned invaluable lessons about leadership, communication, and personal growth. I learned how to stay calm in the face of pressure, how to adapt when things didn't go as planned, and how to trust in my own abilities. Most importantly, I realized that leadership is not about titles it's about making an impact, no matter how small it may seem.

Looking back on my time with IEEE SIES GST, I am filled with an overwhelming sense of gratitude. The journey from volunteering at Techopedia to leading as Secretary has been one of immense growth, both professionally and personally. Each role, each experience, each challenge shaped me in ways I never anticipated.

### **IEEE SECRETARY**

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Looking back on my time with IEEE SIES GST, I am filled with an overwhelming sense of gratitude. The journey from volunteering at Techopedia to leading as Secretary has been one of immense growth, both professionally and personally. Each role, each experience, each challenge shaped me in ways I never anticipated. There were moments of doubt, but they were always followed by moments of growth and realization. The people I worked with, the lessons I learned, and the impact we made together will stay with me forever.

While my tenure has come to a close, I am confident that the work we've done and the relationships we've built will continue to thrive. The spirit of collaboration, dedication, and innovation that defines IEEE SIES GST will carry on, and I look forward to seeing how the chapter evolves in the years to come.

I would like to take a moment to express my heartfelt gratitude to our Branch Counselor, Mr. Biju Balakrishnan, whose support and guidance played an integral role in the chapter's progress. I would also like to extend my thanks to Vaishali Mangrulkar, the WiE In-charge, for her unwavering encouragement and leadership throughout my tenure. Their mentorship and belief in me have been invaluable.

The time I've spent with IEEE SIES GST will always hold a special place in my heart. It's not just about the work we did or the events we organized it's about the people I've had the privilege to work with, the lessons we've learned together, and the lasting friendships we've built. While my official tenure may have ended, the spirit of collaboration, growth, and shared purpose will continue to guide me. I look forward to seeing how the chapter evolves, and I will always cherish the memories and experiences that shaped me along the way.

> ~Persis Bincy Brian IEEE Secretary,2024

### **DESIGN & MEDIA MENTOR**

As a fresher in my first year, I was eager to explore the many opportunities that college life had to offer. One of the first organizations that caught my attention was IEEE SIESGST, and little did I know that it would become such an integral part of my college journey. My first exposure came through Techopedia, the flagship event, held virtually during the pandemic. It was my first college fest, and I was instantly drawn to the creativity, energy, and smooth coordination of the organizing team. Watching the members work together with such dedication and passion inspired me deeply and sparked a desire to be part of this dynamic community.

During Techopedia X, I participated in several events like Nexus, Quantum Break, Labyrinth, and Inquisitive. More than just competitions, these events were learning experiences. I discovered the importance of teamwork, time management, and staying composed under pressure. They also gave me a chance to connect with like-minded, talented individuals, which further deepened my interest in IEEE. voice in the team was heard and valued. Working with a team full of passionate and driven individuals made this phase extremely fulfilling. Whether it was brainstorming for Techopedia, perfecting social media content, or maintaining design consistency across events, each effort was a step toward growth for the team and myself. The synergy, trust, and unity we shared made every challenge feel achievable.

Looking back, IEEE SIESGST has been a pillar of my growth. What began as curiosity became one of the most transformative parts of my college life. From a fresher attending event to mentoring others, every phase taught me resilience, empathetic leadership, and the power of teamwork. These moments didn't just shape my skills they shaped who I am.

A heartfelt thanks to Prof. Biju Balakrishnan Sir Your unwavering support and mentorship played a key role in my growth. Whether it was pushing us to go that extra mile, believing in our abilities, or simply guiding us through challenging times your presence made a difference. Sir, your encouragement helped me strive for excellence, and for that, I'll always be grateful.

To Chinmay Gawas, Kunal Zambare, and Uday Nishad Thank you for being pillars of support throughout this journey. From helping me navigate the challenges of leading the design front to being sounding boards for ideas and decisions, your trust and camaraderie meant a lot. Each of you contributed immensely to my journey, and I'm thankful to have worked with such dedicated and inspiring teammates.

This is your time. Make the most of every moment, every challenge, and every opportunity. Build, learn, fail, improve and most importantly, enjoy the process. You are now part of a legacy driven by creativity,

### **DESIGN & MEDIA MENTOR**

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This is your time. Make the most of every moment, every challenge, and every opportunity. Build, learn, fail, improve and most importantly, enjoy the process. You are now part of a legacy driven by creativity, passion, and commitment. I'm confident you'll raise the bar even higher.

Go IEEE!

~Ankit Sharma Design & Media Mentor,2024

### IEEE MEMBER BENEFITS

IEEE (Institute of Electrical and Electronics Engineers) membership offers a variety of benefits for professionals, researchers, and students in engineering, technology, and related fields. IEEE members are a community of more than 460,000 technology and engineering professionals united by a common desire to continuously learn, interact, collaborate, and innovate. Here are some of the key benefits:

#### 1. Professional Development:

- Access to IEEE e-Learning courses, certifications, and continuing education opportunities.
- Career resources, including job listings and resume-building tools.
- Leadership opportunities through volunteer positions and IEEE committees.

#### 2. Networking & Community

- Membership in local IEEE Sections and Chapters to connect with professionals in your area.
- Special Interest Groups and Societies focused on specific technical fields.
- Access to IEEE conferences, workshops, and events.

#### 3. Access to Research & Publications

- Discounts on IEEE Xplore Digital Library subscriptions, providing access to journals, conference papers, and standards.
- IEEE Spectrum and The Institute newsletters for industry updates.
- Exclusive member pricing for IEEE publications and standards.

#### 4. Discounts & Savings

- Reduced registration fees for IEEE conferences and events.
- Discounts on IEEE products, books, and technical courses.

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• Special rates on insurance, travel, and partner services.

#### 5. Awards & Recognition

- Eligibility for IEEE awards and fellowships recognizing technical and professional achievements.
- Scholarship opportunities for students and early-career professionals.

6. Technical & Industry Resources

- Participation in IEEE standards development.
- Engagement with cutting-edge technological innovations.
- Access to IEEE mentoring programs and career guidance.

IEEE membership is available in different categories, including Student, Professional, and Life Membership, each offering tailored benefits.

IEEE Website: www.ieee.org

~Prof. Biju Balakrishnan Senior Member of IEEE Branch Counselor, IEEE SIESGST SB Advisor, MTTS and CS Chapters

### AI IN CYBER SECURITY

Artificial Intelligence is a broad term that refers to the science of simulating human intelligence in machines with the goal of enabling them to think like us and mimic our actions. This would allow AI machines to perform tasks that previously only human beings could handle. For some tasks, AI may even surpass human beings.

Cybersecurity is essential for protecting our digital assets, including sensitive personal and financial information, intellectual property, and critical infrastructure. Cyberattacks can have serious consequences which mainly include financial loss, reputational damage, and even physical harm. Cybersecurity has become increasingly important in today's internet world. As huge amount of data is stored and transmitted electronically, the risk of cyberattacks has also increased. Cybersecurity is the practice of protecting computer systems, networks, and data from theft, damage, or unauthorized access. Artificial Intelligence is playing a crucial role in modern cybersecurity by enhancing threat detection, response, and prevention.AI is transforming the cvber security in many ways, some of the ways are

Cyber Threat Intelligence: Al analyses past attack data to predict and prevent future threats. Also Al assists cybersecurity teams in proactively searching for hidden threats within networks.

Malware Detection & Prevention: Traditional signature-based antivirus solutions are being replaced with AI-powered solutions that detect new and unknown malware variants.AI models use behaviour analysis to identify malicious software before it executes.

Network Security & Intrusion Detection: AI-driven Intrusion Detection Systems (IDS) and Intrusion Prevention Systems (IPS) can identify and mitigate network threats in real time. AI helps in filtering out false positives and prioritizing real threats.

 Phishing Detection & Email Security: AI can analyze email content, sender behavior, and URL links to detect phishing attempts. Natural Language Processing (NLP) helps in identifying deceptive language used in phishing emails.

2. User Analytics (UBA): AI **Behavior** activity and detects monitors user deviations from normal behavior, which could indicate insider threats or compromised accounts. It helps in unauthorized preventing access and privilege escalation attacks.

3. Identity & Access Management (IAM) : AI enhances multi-factor authentication (MFA) by analysing user behaviour to determine the legitimacy of login attempts. Biometric authentication systems, such as facial recognition and fingerprint scanning, use AI for accuracy and security.

4. Adversarial AI & Cyber Défense: AI is also being used by cybercriminals to create sophisticated attacks, such as deepfakebased scams and automated hacking tools. Security teams use AI to simulate cyberattacks (penetration testing) and improve defences against AI-driven threats.

Having this intelligence would provide cybersecurity organizations with a significant edge in preventing future attacks. Stopping breaches before they occur would not only help protect the data of individuals and companies, but also lower IT costs for businesses. AI will continue to evolve with advancements in deep

## AI IN CYBER SECURITY

learning, quantum computing, and automated security frameworks.Al-driven self-healing systems may become more common, allowing organizations to autonomously detect, respond to, and recover from cyberattacks.

> ~Prof. Vaishali Mangrulkar WiE Incharge, IEEE SIES GST

### NEUROMORPHIC COMPUTING FOR THE SPACE SITUATIONAL AWARENESS

In the "New Space" age, orbital debris poses a growing threat to active satellites and future missions. Effective space situational awareness (SSA) necessitates advanced technologies on board. Neuromorphic computing, which mimics the neural architecture of the human brain, offers a promising approach with its energyefficient, high-speed processing capabilities. Operating asynchronously, these systems detect environmental changes with precise resolution, temporal enabling accurate detection and tracking of orbiting objects. For event-based sensors instance, have demonstrated the ability to observe resident objects in space across different orbital regimes, both day and night.

Neuromorphic computing can also enhance capabilities on a software level through advanced neural networks, such as Convolutional Spiking Neural Networks (CSNNs). These networks efficiently process spatiotemporal data, making them suitable for analyzing dynamic inputs from the event-based sensors. Research has shown that deep neural networks can effectively discriminate between active satellites, debris and rocket bodies using light curve data.

The advantages of neuromorphic systems in SSA are clear. Their low power consumption makes them ideal for space missions with limited energy resources. They can capture rapid environmental changes, crucial for tracking high-speed debris, are robust in diverse lighting conditions and are resilient to sensor noises.

Despite these benefits, challenges remain. Specialized hardware capable of withstanding harsh space conditions and optimized algorithms for event-based data structures are essential pitfalls to overcome. Ongoing study continues to address such challenges, exploring the integration of neuromorphic computing in space surveillance and tracking systems [3]. In conclusion, neuromorphic computing holds significant promise to enhance SSA. Its ability to process complex and dynamically changing data efficiently makes it a transformative technology in ongoing efforts to mitigate space debris and ensure a safer space for everyone in the future.

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~Hanga Katreiner

### DIGITAL TWINS: THE FUTURE OF PREDICTIVE MAINTENANCE IN INDUSTRY 4.0

#### INTRODUCTION

The evolution of Industry 4.0 has led to the emergence of Digital Twins, virtual representations that combine IoT, artificial intelligence, and advanced analytics to monitor, optimize, and simulate industrial systems in real-time (Qi et al., 2021; Jones et al., 2020).

#### **Industrial Applications**

1. Predictive Maintenance: Digital twins analyze real-time data from IoT sensors to predict failures using advanced machine learning algorithms. For instance, algorithms such as Random Forest, Artificial Neural Networks (ANN), and Support Vector Machines (SVM) detect anomalies and degradation patterns (Tao et al., 2019; Boschert & Rosen, 2021). In the aerospace sector, predictive models have reduced machine downtime by 30% and maintenance costs by 25% (Negri et al., 2020).

2. Process Optimization: Advanced simulations enable testing of operational changes without disrupting production. For example, a digital twin can automatically optimize processing parameters, reducing energy waste by up to 15% (Negri et al., 2020).

3. Recent Innovations: The adoption of deep learning techniques integrated with blockchain ensures data security and integrity in digital twins, particularly in regulated sectors such as pharmaceuticals and aerospace (Zhang et al., 2021). Predictive models based on Bayesian analysis and ensemble methods are further enhancing the reliability of predictive maintenance.

#### CHALLENGES AND FUTURE PROSPECTS

Despite its advantages, implementing digital twins requires robust IoT infrastructures and

advanced cybersecurity. With the introduction of 5G and advanced artificial intelligence, Gartner (2023) predicts that by 2027, 50% of manufacturing companies will adopt digital twins as an operational standard.

Conclusion

Looking ahead, digital twins, supported by advanced predictive algorithms, are transforming the manufacturing industry into a more intelligent and sustainable production model. Further development of global standards and AI technologies will be crucial to maximizing efficiency and security.

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~Pierpaolo Vergati

### **EMPOWERING INNOVATION: RECENT** IEEE INITIATIVES IN INDIA FOR 2024

Purpose and Relevance: This article will spotlight recent IEEE programs and initiatives in India during 2024, showcasing how IEEE is driving technological progress, fostering innovation, and empowering students, professionals, and researchers in the region. With India emerging as a global hub for technology and engineering, highlighting IEEE's contributions here aligns with its mission of advancing technology for humanity.

1. Overview of IEEE in India (2024): India boasts one of the largest IEEE memberships globally, with numerous active chapters across universities and cities. In 2024, IEEE India has strengthened its focus on collaborative research, education, and community impact. Partnerships with top academic institutions like IITs and NITs, as well as tech corporations, are driving research and innovation.

2. Highlighted Programs and Events: IEEE **R10** Humanitarian Technology Conference (HTC): The 2024 HTC held in leveraging focused on Bengaluru technology for social good. Key themes included renewable energy solutions, water management systems, and digital healthcare innovations. Notable projects showcased included a low-cost solar-powered water purifier and AI-driven platforms for rural healthcare diagnostics.

3. Education and Skill Development Initiatives: IEEE Skill Connect Program: A series of workshops and bootcamps aimed at upskilling engineering students and young professionals. Topics included machine learning, blockchain technology, robotics, and cyber-physical systems. Over 5,000 participants benefited, with many reporting increased job opportunities.

- 4. Encouraging Women in Technology: IEEE Women in Engineering (WIE) Programs: In 2024, WIE India organized events focusing on mentorship, leadership, and career development for women in STEM. Highlights included a Women in Tech Summit in Mumbai and scholarships for female students pursuing research in AI and renewable energy. These initiatives inspired more women to pursue careers in technology.
- 5. Global Impact of Indian IEEE Members: Indian IEEE members have been at the forefront of advancements in quantum computing, 5G networks, and sustainable energy. Notable recognition includes Dr. Kavita Sharma's award for research in green energy storage systems and accolades for Indian student teams at global competitions.
- 6. Future Directions: IEEE plans to extend rural technology access through solarpowered digital learning centers, deepen industry-academic collaborations, and focus on integrating AI ethics and data privacy into curricula.

~Hetal Mistry

### AN IOT-POWERED SYSTEM FOR SMART HOME AUTOMATION

Home automation has become increasingly popular with the rapid advancement of technology, making daily life more convenient and efficient. The integration of the Internet of Things (IoT) has further revolutionized this field by enabling remote monitoring, control, and automation of smart devices. A smart home leverages IoT to connect sensors, actuators, and other devices, allowing users to automate household functions such as lighting, security. temperature and control. Bv incorporating wireless sensor networks, IoT facilitates seamless communication between smart devices, ensuring a connected and intelligent living environment.

One of the key advantages of home automation is its accessibility through multiple interfaces, such as voice assistants, smartphones, tablets, and computers. Users can remotely control their home appliances, monitor security cameras, and automate energy-saving measures, contributing to both convenience and efficiency. Home automation systems enhance security through smart locks and surveillance systems, optimize energy usage through intelligent lighting and climate control, and save time by automating repetitive tasks. As a result, smart homes are not only lifestyles but also promoting improving sustainable living by reducing unnecessary power consumption.

QToggle is an open-source IoT automation system designed to monitor, manage, and automate connected devices seamlessly. It provides a web-based user interface. eliminating the need for additional software installations. The system is built on a robust API framework that allows for easv communication between devices. QToggle consists of three main components: QToggle Core, which manages communication and automation processing; QToggle Devices,

which include IoT hardware like Raspberry Pi and ESP8266; and QToggle UI, which offers a user-friendly dashboard for device configuration and control.

The flexibility of QToggle makes it highly suitable for various IoT applications. It supports multiple communication protocols, including MQTT, HTTP, and WebSockets, enabling smooth integration with different devices. The system's automation engine allows users to define custom rules and triggers, ensuring intelligent automation based on sensor inputs. Additionally, QToggle supports edge computing, allowing it to function without continuous reliance on cloud connectivity. This ensures secure, real-time processing, making it a reliable solution for home automation.

The adoption of IoT-based smart home systems like QToggle offers numerous benefits. It enhances security by enabling remote monitoring of door locks and security cameras. It improves energy efficiency through smart lighting and climate control, ultimately reducing electricity consumption. The convenience of managing household appliances remotely also adds to its appeal. Furthermore, automation saves time and effort by reducing the need for manual intervention in routine tasks. With the continued evolution of IoT technology, smart home automation is set to become even more sophisticated, providing enhanced comfort, security, and sustainability for modern households.

> ~Prof. Swapnil B. Wani Asst. Professor SIESGST, Nerul

### THE B-2 BOMBER: A STEALTH MARVEL OF THE SKIES

The B-2 Spirit, often called the B-2 Bomber, is one of the most amazing planes ever created. Its sleek and futuristic look, combined with advanced technology, makes it a masterpiece of engineering and a symbol of human creativity. What makes the B-2 so special is its ability to avoid radar detection, earning it the nickname "stealth bomber." This means it can fly into enemy territory without being spotted. Its special shape, called a flying-wing design, helps it stay hidden by not reflecting radar signals. The plane is also covered in materials that absorb radar waves, making it even harder to detect.

The B-2's design is very unique. Unlike other planes, it doesn't have a tail or visible stabilizers. This not only helps with stealth but also makes the plane very efficient in the air. Because of this, the B-2 can fly very long distances without needing to stop and refuel. It can even travel around the world if needed. Its design is so futuristic that many people think it looks like something out of a science fiction movie. But the B-2 isn't just about looks; it's packed with powerful technology. It can carry different types of weapons, including regular bombs and nuclear ones, making it very versatile. It can hold up to 40,000 pounds of weapons and drop them with incredible accuracy, even in bad weather or tough conditions.

One of the most impressive things about the B-2 is how far it can go. It can fly over 6,000 miles without refueling. And if it gets refueled in the air, it can stay flying for more than 40 hours! This means it can reach targets anywhere in the world. Built by the company Northrop Grumman, the B-2 Spirit first flew in 1989 and officially started its service in 1997. Even though only 21 of these planes were made because they are very expensive, they have proven to be worth every penny. The B-2 has been used in many important missions, helping to keep the world safe by preventing conflicts and stopping threats before they escalate.

The B-2 is one of the most costly planes ever made, with each one costing over \$2 billion. This price includes the research and special materials needed to make it. Even though it's expensive, the B-2 is considered a priceless tool because of what it can do. It has inspired the development of new and better planes. The technology used in the B-2 has led to improvements in materials, design, and navigation systems that are now being used in both military and civilian planes. As technology improves, the ideas behind the B-2 will continue to shape the future of aviation.

The B-2 Bomber isn't just a plane; it's a symbol of human ingenuity and determination. Its ability to stay hidden, travel far, and deliver weapons with precision makes it a key part of modern military strategies. At the same time, its iconic design captures the imagination of everyone who sees it. Whether it's flying high above or sitting on the ground, the B-2 Spirit represents what is possible when we push the limits of technology. It's not just a machine; it's a legend and a marvel of our time.

It takes a team effort to combat electromagnetic pollution. By staying away from high-radiation equipment, using wired connections where feasible, and using EMFshielding materials, people can reduce their exposure. Low-EMF devices and adaptive techniques like beamforming, which targets particular regions to cut down on needless emissions, are examples of the new technologies being developed in the meantime.

~Naeem Parkar

### FARTHEST MESSENGER

Launched by NASA on September 5, 1977, Voyager 1 has become an enduring symbol of human curiosity and exploration. Initially part of a mission to study Jupiter and Saturn, the surpassed expectations spacecraft bv continuing its journey far beyond the outer planets. Its observations of these gas giants, including the discovery of active volcanism on Jupiter's moon lo and detailed images of Saturn's rings, revolutionized our understanding of the solar system.

In August 2012, Voyager 1 achieved a historic milestone by becoming the first humanmade object to enter interstellar space, crossing the heliopause the boundary where the Sun's influence ends. Now over 23 billion kilometers away, it continues to send data about cosmic rays, magnetic fields, and interstellar plasma, offering invaluable insights into this uncharted region of space.

Equipped with the Golden Record, a 12-inch phonograph containing sounds, images, and messages from Earth, Voyager 1 serves as a time capsule, representing humanity's culture and diversity. Despite its increasing distance, the spacecraft remains operational, powered by its nuclear energy source. Voyager 1 embodies the spirit of exploration, reminding us of humanity's ingenuity and our profound connection to the cosmos. Its mission continues to inspire generations to reach for the stars.

~Dona Manoj

## ELECTROMAGNETIC POLLUTION: AN INVISIBLE THREAT

"Technology is a dangerous master but a helpful servant." - Christian Lous Lange Christian According to Lous Lange, technological innovations that make our lives easier can also present serious problems if they not controlled. The unintentional are electromagnetic radiation released by contemporary technology like power lines, Wi-Fi routers, and cellphones is known as electromagnetic pollution or electrosmog. Despite the necessity of these technologies, their by-product, electromagnetic fields (EMFs), raises questions about possible hazards to the environment, electronic systems, and human health. Both manmade and natural factors contribute to electromagnetic pollution. Like the Earth's magnetic field, natural EMFs are both necessary and innocuous. More worrisome, though, artificial EMFs are produced by infrastructure and technological equipment. According to studies, extended exposure to artificial electromagnetic fields (EMFs) may cause symptoms like headaches, exhaustion, and irregular sleep patterns. Precautionary steps are advised even if the long-term health effects are still up for debate. Electromagnetic interference (EMI) affects more than only health; it interferes with delicate systems like navigational aids and communication networks. Reduced signal quality and electromagnetic congestion are additional problems in urban settings because of the high number of devices there.

effort takes team combat lt a to electromagnetic pollution. By staying away from high-radiation equipment, using wired connections where feasible, and using EMFshielding materials, people can reduce their exposure. Low-EMF devices and adaptive techniques like beamforming, which targets particular regions to cut down on needless emissions. are examples of the new technologies being developed in the meantime.

Urban planners and governments are also quite important. Risks can be significantly reduced by putting in place EMF monitoring systems in urban areas, controlling the positioning of communication towers, and informing the public about safe procedures. In order to assist people comprehend the significance of modest acts, like turning off gadgets when not in use or avoiding close proximity to EMF hotspots like routers and power lines, public awareness campaigns are very important. Addressing electromagnetic pollution is crucial to ensuring a harmonious cohabitation of innovation and well-being as technology continues to change our world. We can take advantage of technology while protecting our environment and health by innovation, combining regulation, and awareness.

> ~Rajlekha Bhowmick SE EXTC

### FROM CIRCUITS TO NEURONS: THE FUTURE OF SMART COMPUTING

As artificial intelligence and deep learning revolutionize technology, continue to traditional computing architectures are struggling to keep pace. The demand for faster, more energy-efficient computing has driven researchers to explore an alternative paradigm Neuromorphic Computing. Inspired by the human brain, neuromorphic systems aim to bridge the gap between silicon and synapses, offering a more efficient, adaptive, and intelligent approach to computation. The Evolution of Computing: From Von Neumann to Brain-Inspired Models For decades. computing has relied on the Von Neumann architecture, where memory and processing units are separate, creating an inherent bottleneck in speed and efficiency. The human brain, on the other hand, processes information massively parallel through neurons and synapses, consuming significantly less power than even the most advanced supercomputers.

Neuromorphic computing seeks to replicate this efficiency using spiking neural networks (SNNs) and specialized hardware designed to function like biological neural circuits. Unlike conventional AI models that require extensive power and memory, neuromorphic chips execute tasks with high efficiency, even in resource-constrained environments. The concept of neuromorphic computing was first introduced by Caltech professor Carver Mead in the early 1980s. Mead pioneered the development of analog silicon retina and cochlea, laying the groundwork for biologically inspired computing. He envisioned a future where computers could replicate the processing capabilities of the human nervous system, provided we could fully understand how the brain functions.

This vision led to groundbreaking innovations in neuromorphic hardware. In 2014, IBM

introduced the TrueNorth neuromorphic chip, designed for visual object recognition while consuming minimal power compared to traditional computing systems. In 2018, Intel unveiled the Loihi neuromorphic chip, which found applications in robotics, gesture recognition, and even smell detection. These developments signaled the dawn of a new era in computing.

**Applications:** A Paradigm Shift in Computing Neuromorphic computing is more than just an academic pursuit; it has real-world implications across various industries:

• Healthcare & Neurological Research: Neuromorphic systems can analyze brainwave patterns in real time, assisting in early detection of neurodegenerative diseases like Alzheimer's.

• Edge AI & IoT: Smart sensors and wearables can process data locally, reducing reliance on cloud computing and improving response times.

• Autonomous Systems: Self-driving cars and robotics can make real-time decisions with ultra-low power consumption.

• Cybersecurity & Pattern Recognition: Neuromorphic processors excel at detecting anomalies in complex datasets, making them invaluable in threat intelligence and security automation.

The Road Ahead: A Call to Action With companies like Intel (Loihi), IBM (TrueNorth), and BrainChip (Akida) leading the charge, neuromorphic computing is poised to redefine artificial intelligence and machine learning.

We stand on the brink of a computing revolution one that will transform the way machines perceive, process, and respond to

## FROM CIRCUITS TO NEURONS: THE FUTURE OF SMART COMPUTING

information. This is a call to innovators, researchers, and engineers to push the boundaries of what is possible. The fusion of silicon and synapses is no longer just a theory; it is an unfolding reality.

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~Jeevitha Gowda

### THE RISE OF DIGITAL TWINS IN SMART CITIES

In the accelerated world of technological innovation, one revolution that can define the shape of smart cities soon is something called digital twins. Digital twins mean a virtual twin of the real world's object or system-whether a building, city block, or entire urban landscape. Digital twins blend the real time and advanced simulation tools to develop innovative ways for the monitoring and analysis of urban environments in ways that do not intrude on reality.

Since urban areas have become increasingly congested and complicated, the need to manage resources and infrastructure efficiently is a challenge. Digital twins address the issues by letting planners and city officials simulate scenarios and predict the outcomes. For instance, they can analyze traffic patterns to optimize signal timings, plan new public routes, transport or reduce energy consumption in buildings by monitoring usage trends. In disaster management, digital twins can simulate events like floods or earthquakes to help cities prepare more effectively and minimize damage. Digital twins are already used in cities such as Singapore and Dubai to rethink urban living. Singapore's digital model of the whole city allows for planning and infrastructure management. Dubai uses this technology to enhance energy consumption while improving public transport. Such applications show how, besides increasing efficiency in operations, digital twins help promote sustainability through a reduction in waste and smart use of Resources.

However, creating digital twins comes with its set of challenges. Building and maintaining these systems requires a robust Internet of Things infrastructure, which can be expensive. There are also concerns about data privacy and security since digital twins rely heavily on realtime data collection from various sources. Ensuring that this information is protected from breaches and misuse is critical to the widespread adoption of this technology.

Despite these obstacles, the prospects for digital twins in smart cities are bright. The cost of IoT devices and computing power continues to fall; this will continue to make such an approach more accessible for cities around the world. As students, the topic of digital twins is quite exciting because of its intersection of technology and solving real-world problems, giving a chance to participate in smarter and more sustainable urban development.

The rise of digital twins indicates a future in which cities are not only smart but also responsive to the needs of their residents. This technology is likely to revolutionize urban living on a global scale by filling the gap between the physical and virtual worlds.

~Prerna Rudra

### AGI: THE NEXT LEAP IN HUMAN EVOLUTION

Gone are the days when one would wonder if machines could ever think, learn, and adapt as humans do. This science fiction-esque question, once dismissed ignorantly by much of the population, has now come back to challenge us, becoming the driving force behind Artificial General Intelligence (AGI). The AI we see and use today is designed and trained to excel at specific tasks, whereas AGI represents the ability to perform and approach any task with human-like adaptability. This very capability makes a compelling case for AGI to redefine not only technology but the very fabric of society.

The current AI systems, namely Artificial Narrow Intelligence (ANI), power applications ranging from language translation to medical diagnostics. However, these systems are hard lined to generalize knowledge, failing to reason creatively. AGI seeks to bridge this gap by developing systems capable of understanding, learning, and innovating across diverse domains.

In theory, AGI may seem like a utopian technology, but it poses challenges that the average person might struggle to grasp. Replicating human-like cognition requires breakthroughs in computational efficiency, learning algorithms, and even understanding consciousness itself. Furthermore, the risks are profound, including the possibility of AGI making autonomous decisions that conflict with human values. perhaps inviting unfortunate trouble and dare I say even catastrophic outcomes.

Yet, the promise of AGI remains immense. From accelerating scientific discoveries to addressing global challenges, its potential benefits are unprecedented provided we approach its development with ethical design, robust regulations, and transparent processes.

The only question that remains is: are we truly prepared for a world reshaped by AGI? Could this pursuit of mimicking human intelligence force us to confront the very limitations of our own reasoning?

~Shreyas Zond

### ISRO DOCKING SYSTEM: A LEAP FORWARD IN SPACE TECHNOLOGY

The Indian Space Research Organisation (ISRO) has made significant strides in space technology with the development of its indigenous docking system, a critical component for future space missions. This system, designed to enable the connection of two spacecraft in orbit, marks a major milestone in India's quest for self-reliance in space exploration and its ambitions for manned missions, space stations, and lunar exploration.

The docking system is a sophisticated piece of engineering that allows spacecraft to align, connect, and transfer resources such as fuel, cargo, and crew. ISRO's version, tested successfully in 2021 during the Space Docking Experiment (SPADEX), demonstrated the ability to autonomously dock two satellites in low Earth orbit. This achievement places India among an elite group of nations capable of such advanced space operations.

One of the primary applications of ISRO's docking system is the Gaganyaan mission, India's first manned spaceflight program. The system will enable the crew module to dock with other modules or space stations, ensuring the safety and sustainability of astronauts in space. Additionally, it paves the way for India's proposed space station, slated for completion by 2035, and future lunar missions, where docking capabilities will be essential for assembling and maintaining infrastructure.

The technology behind ISRO's docking system includes advanced sensors, guidance systems, and propulsion mechanisms that ensure precision and reliability. The system's autonomous capabilities reduce human intervention, minimizing risks during critical operations. ISRO's docking system not only underscores India's growing prowess in space technology but also opens doors for international collaboration. By mastering this technology, India can contribute to global space missions, including lunar bases and Mars exploration.

In conclusion, ISRO's docking system is a testament to India's innovation and determination to explore new frontiers. It represents a giant leap forward, positioning India as a key player in the future of space exploration.

~Sai Shreyas

THE GAMING REVOLUTION

The Evolution and Impact of Gaming in the Modern Era. The gaming industry has grown from a niche hobby into a global cultural and economic powerhouse. What began with simple pixelated games has evolved into a multifaceted industry encompassing lifelike graphics, immersive storylines, and competitive esports. This article will explore the evolution of gaming, its impact on society, and the future it holds.

#### The Origins of Gaming:

The first video games date back to the early 1950s when scientists and engineers began experimenting with computer-based interactive entertainment. One of the earliest examples, Tennis for Two (1958), laid the groundwork for what would eventually become a multi-billiondollar industry. By the 1970s and 1980s, classic arcade games like Pong, Pac-Man, and Space Invaders became cultural icons, driving the video game industry into mainstream entertainment.

#### The Rise of Console Gaming:

The launch of home consoles in the late 1970s and early 1980s, such as the Atari 2600, marked the first time video games became accessible to the masses. However, it was the release of the Nintendo Entertainment System (NES) in 1985 that redefined the market. Games like Super Mario Bros. and The Legend of Zelda became household names, combining engaging gameplay with memorable characters and stories.

As technology advanced, so did gaming consoles. The 1990s saw the emergence of more powerful platforms like the Sega Genesis and Sony's PlayStation, ushering in the era of 3D gaming. With titles such as Final Fantasy VII and The Legend of Zelda: Ocarina of Time, storytelling and complex gameplay mechanics became the norm.

#### The Age of Online Gaming:

The late 1990s and early 2000s saw the advent of online gaming, which revolutionized how players interacted with each other. PC games like Counter-Strike, World of Warcraft, and EverQuest allowed players to compete or collaborate with others from across the globe. This shift in gaming culture not only expanded the reach of video games but also laid the foundation for modern multiplayer and esports.

The rise of high-speed internet and powerful gaming consoles, such as Microsoft's Xbox and Sony's PlayStation 2, accelerated this trend. Online multiplayer modes became an essential feature, changing the dynamics of gameplay. Games like Halo 2 and Call of Duty set the stage for what would become the massively popular esports scene.

#### Mobile Gaming: A New Frontier

The arrival of smartphones introduced gaming to an even wider audience. Simple, addictive games like Angry Birds and Candy Crush Saga reached millions of players who might not have considered themselves gamers. Mobile gaming's accessibility and convenience fueled its growth, making it the most profitable segment in the gaming industry by the 2010s.

#### The Rise of Esports:

Esports, or competitive gaming, has become one of the most significant developments in the industry. Once considered a niche pastime, it now boasts massive tournaments with prize pools reaching tens of millions of dollars. Games like Dota 2, League of Legends, and Fortnite have driven this movement, attracting professional players, sponsorships, and even

### THE GAMING REVOLUTION

recognition from traditional sports organizations. Today, esports events fill stadiums and draw viewership comparable to major sports leagues, showcasing the influence of gaming as a global phenomenon.

#### The Cultural and Social Impact:

Gaming has long been more than just entertainment. It serves as a social platform, bringing people together from diverse backgrounds. Multiplayer games encourage teamwork and communication, while online communities enable players to forge friendships and connections that transcend geographical boundaries.

However, gaming has also faced criticism. Concerns over screen time, violent content, and its potential for addiction have sparked debates about the responsibilities of game developers and the need for regulations. Despite these challenges, studies have shown that gaming can have positive effects, such as improved handeye coordination, problem-solving skills, and even stress relief.

#### The Future of Gaming:

The future of gaming looks incredibly promising, driven by emerging technologies. Virtual reality (VR) and augmented reality (AR) have already started transforming the way people experience games. Platforms like the Oculus Quest and PlayStation VR offer immersive experiences that blur the lines between the virtual and physical worlds.

Artificial intelligence (AI) is another trend shaping the industry, enhancing gameplay through smarter non-playable characters (NPCs) and adaptive game mechanics. Meanwhile, cloud gaming services like Google Stadia and NVIDIA GeForce Now are making high-quality gaming more accessible without the need for expensive hardware.

#### **Conclusion:**

Gaming has come a long way from its humble beginnings as a niche form of entertainment. It has grown into a cultural and economic juggernaut, influencing music, film, and even fashion. With innovations in VR, AR, AI, and cloud technology, the gaming industry shows no signs of slowing down. As it continues to evolve, gaming will not only provide new forms of entertainment but also foster communities and redefine how we interact with the digital world.

~Himanshu Gowda

### PROTECTING FILES WITH CONTENT DISARM AND RECONSTRUCTION (CDR)

Most malware infections start with a phishing email. Of these, a significant portion use a malicious document as the delivery mechanism. In 2020, more than 70% of malicious email attachments or links and about 30% of malicious web downloads were delivered via documents such as PDF, Microsoft Office Word, Excel and PowerPoint.

Although a document can be exploited, this doesn't necessarily imply that it is entirely harmful. Microsoft Office documents are essentially structured as ZIP files, which include various folders containing multiple files. Therefore, the malicious script within an Office file is just one component among several others it holds.

PDFs are similar in that they are also built from a collection of different pieces. A malicious PDF file contains several objects that combine to create the file that the recipient sees. However, only one or a few of these objects contain the malicious script code hidden within the document.

Introducing Content Disarm and Reconstruction:

Forwarding a potentially malicious Microsoft Office or PDF file on to the intended recipient is very risky. There is always the chance that the recipient will open the file, enable macros, and their with infect computer malware. Additionally, this approach relies upon detection of malicious content. On the other hand, deleting the file entirely runs the risk that the recipient will miss important information that was included in the weaponized document. Content disarm and reconstruction offers a safe alternative to simply blocking malicious files.

In a weaponized Microsoft Office or PDF file, only a small part of the document is harmful usually any executable content embedded within it, like macros or scripts. With Content and Reconstruction (CDR), these Disarm harmful elements are removed, and the document is rebuilt using the remaining safe This process often parts. involves reconstructing the file, so it no longer contains any references to the malicious content. CDR the ensures document remains intact. preserving its original information, while removing any threat, making it safe to open and use without risking malware infection.

#### **Benefits of CDR**

Check Point Sandblast's offers an industryleading Content Disarm and Reconstruction (CDR) solution. Sandblast Threat Extraction provides a number of benefits for organizational cybersecurity and employee productivity, including:

- Minimal Recipient Impact: Any malicious content is designed to be invisible to the recipient, so CDR has no impact on actual information conveyed by the file.
- Safe Delivery: By removing the executable content from the document, the file becomes safe for the recipient, making it possible to send it on to them without risking malware delivery.
- Zero Day Protection: CDR removes executable content whether it is detected as malicious. This enables it to protect against zero-day threats.
- Rapid Delivery: CDR eliminates delays associated with traditional sandboxes and enables real-world deployment for <u>zero-day</u> <u>protection</u> in prevent mode, while delivering cleaned files to users quickly.
- Original File Access: In some cases, access to executable content may be required for benign files. With Check Point Sandblast, the original file may be accessed by the user after it is confirmed to be benign after sandbox inspection.

### PROTECTING FILES WITH CONTENT DISARM AND RECONSTRUCTION (CDR)

Check Point Harmony Offers CDR Security Options Across the Board While phishing emails are the most common and most wellknown method of delivering malicious documents and malware to a recipient, they are far from the only option. Malicious content can be delivered over corporate collaboration platforms (like Slack and Microsoft Teams), via text messaging, over social media and other mobile apps, and via downloads from malicious or compromised websites.

For this reason, CDR must be deployed to protect all these potential infection vectors to be effective. Check Point's Harmony technology is available for all platforms with Harmony Endpoint (endpoint security), Harmony Mobile (mobile security), and Harmony Browse

By implementing Check Point's Harmony technology, an organization can protect its users from the most common methods of malware delivery, such as malicious files or links. while still maintaining employee productivity. The technology works by processing files in multiple stages, ensuring that potentially harmful content like executable code is thoroughly checked before being accessed. This means employees can receive files promptly, but they are only able to open and interact with the executable parts once those files are verified to be harmless, preventing any risk of malware infection while avoiding unnecessary delays.

~Tanmeet Kaur

### THE INTERSECTION OF AI AND CREATIVITY: A TECHNICAL AND PHILOSOPHICAL EXPLORATION

Artificial Intelligence (AI) has transitioned from a tool for data analysis and automation to an entity capable of generating creative works, challenging our fundamental understanding of creativity and originality. As AI models such as Generative Adversarial Networks (GANs), transformers, and multimodal AI systems grow increasingly sophisticated, they have remarkable capabilities demonstrated in generating art, music, literature, and even scientific innovations. This transformation raises technical and philosophical both questions about the nature of creativity, authorship, and human-AI collaboration.

From a technical standpoint, AI-driven creativity is rooted in deep learning architectures that analyze vast datasets to generate novel outputs. Models such as GPT for writing, DALL·E for visual art, and Jukebox for music composition leverage neural networks to recognize and replicate patterns from existing works. These systems employ unsupervised learning and reinforcement learning techniques to enhance their generative capacities, pushing the boundaries of machine-generated creativity. However, AI's dependence on pre-existing data means that it does not create in the same way as humans it recombines and refines learned patterns rather than producing ideas from intrinsic experience or inspiration. This raises an essential question: can AI truly be creative, or is it merely mimicking human ingenuity?

Beyond the technical aspects, the philosophical debate surrounding AI and creativity continues to evolve. Traditional views of creativity emphasize originality, intent, and emotional depth qualities that AI lacks. While AI can generate a visually stunning compose a symphony painting òr indistinguishable from human-created pieces, does it possess intent or artistic vision? The concept of AI as a co-creator rather than an

independent artist offers a compelling perspective, wherein AI acts as an amplifier of human imagination rather than a replacement for it. This collaboration is evident in the way AI-assisted tools enable designers, writers, and musicians to explore creative possibilities beyond human limitations.

The implications of Al-driven creativity extend to ethical and societal concerns, particularly regarding intellectual property and authorship. If an AI-generated novel becomes a bestseller, who owns the rights? The programmer who developed the algorithm, the user who provided input, or the AI itself? The absence of legal frameworks to address these dilemmas creates uncertainties that must be resolved as AI continues to shape creative industries. Additionally, the widespread use of AI in art and media raises concerns about job displacement and the commodification of creativity, where machine-generated works may devalue human effort.

Despite these concerns, AI has the potential to democratize creativity by making artistic expression more accessible. AI-powered tools lower the technical barriers to entry, enabling individuals without formal artistic training to generate compelling works. This democratization fosters inclusivity and innovation, encouraging a broader range of creative voices. However, it also highlights the need for ethical guidelines to ensure responsible Al usage in creative fields.

As AI continues to evolve, the future of AIdriven creativity lies in symbiosis rather than replacement. Rather than replacing human artists, AI serves as an extension of human expression, providing new mediums and tools for creative exploration. The next frontier in AI and creativity involves refining these collaborations, addressing ethical concerns, and

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### THE INTERSECTION OF AI AND CREATIVITY: A TECHNICAL AND PHILOSOPHICAL EXPLORATION

ensuring that AI remains a complement to human ingenuity rather than a substitute for it. By navigating these challenges thoughtfully, we can harness AI's potential to redefine and expand the creative landscape while preserving the essence of human originality.

~Persis Bincy Brian

#### Seminar on 5G Technology – Event Summary

The Seminar on 5G Technology, organized modern technological advancements. by IEEE SIESGST on August 14, 2024, was an educational and insightful event aimed at providing participants with a comprehensive understanding of the evolution of mobile communication technologies. The session was open to undergraduate students and was designed to shed light on how wireless networks have advanced from 1G to the revolutionary 5G era.

The keynote speaker, Mr. Aiyappan, Founder of Congruent Services and a seasoned expert in IT advisory and business transformation, shared his deep industry insights on the subject. He discussed the technological milestones of previous generations highlighting the transition from analog to digital communication in 2G, the introduction of mobile internet in 3G, and the high-speed advancements of 4G before delving into the transformative capabilities of 5G.

The event explored 5G's game-changing features, including ultra-low latency, massive device connectivity, and high-speed data transmission, making it a foundation for future innovations. Key real-world applications were discussed, such as smart cities, industrial autonomous vehicles, and automation. healthcare advancements like remote surgeries and telemedicine. Unlike its predecessors, 5G is not just an enhancement in mobile connectivity but a critical enabler for the Internet of Things (IoT) and Artificial Intelligence (AI)-driven technologies.

The seminar left a significant impact on attendees, helping them understand the critical role of 5G in shaping the future. Participants engaged in discussions on its potential applications across industries, making the event both thought-provoking and highly relevant to



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#### **Blockchain Webinar – Event Summary**

The webinar "Blockchain: Beyond the Buzz - From Cryptos to Contracts", organized by IEEE SIESGST on August 3, 2024, aimed to provide participants with a comprehensive understanding of blockchain technology beyond its popular association with cryptocurrencies. The event attracted students, professionals, and technology enthusiasts, highlighting the growing curiosity around decentralized technologies.

The keynote speaker, Mr. Amit Chandra, a Hyperledger Foundation Member with experience at EY, IBM, NTT DATA, and Capgemini, shared his expertise on blockchain fundamentals, smart contracts, and Web3 applications. He began by explaining the core principles of blockchain, such as distributed ledgers, cryptographic security, and consensus mechanisms, laying a strong foundation for attendees new to the technology.

The session then explored blockchain's role in cryptocurrencies, detailing how Bitcoin and other digital assets function using blockchain networks. However, the discussion extended further into smart contracts, self-executing agreements that are transforming industries by eliminating intermediaries and automating transactions. Additionally, the speaker introduced Web3, explaining how it differs from Web2 and showcasing its decentralization, user ownership, and potential for new business models.

To reinforce blockchain's real-world impact, case studies were shared on its applications in supply chain management, healthcare, and finance, demonstrating how it enhances security, transparency, and efficiency.

The event successfully broadened participants' perspectives on blockchain, sparking increased

interest in its potential applications. Many attendees expressed enthusiasm about further exploring blockchain technology, making the webinar an engaging and insightful learning experience.



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#### **Neural Networks Workshop**

The Neural Networks 0-1 workshop, organized by IEEE SIESGST on 6th and 7th August 2024, was a two-day hands-on technical session designed to introduce students to the fundamentals of neural networks, a crucial component of artificial intelligence and machine learning. The first day focused on the basics, covering perceptrons, activation functions, and the structure of neural network layers, allowing participants to build simple models and understand their underlying concepts. On the second day, the workshop advanced topics such delved into as backpropagation and gradient descent, providing attendees with the opportunity to implement and fine-tune their own neural network models.

The interactive format allowed students to apply theoretical knowledge in real-time coding sessions, making the learning experience more engaging and practical. The event concluded with a Q&A session, where participants interacted with experts to clarify their doubts and gain deeper insights into neural networks. received overwhelmingly The workshop positive feedback, with attendees appreciating the hands-on approach and expressing a keen interest in more advanced sessions. The success of the event not only enhanced participants' technical skills but also sparked curiosity in AI research and collaboration. By fostering innovation and learning, IEEE SIESGST continues to pave the way for future advancements in technology through such impactful workshops.





#### **EPSILON 2024:**



Epsilon 2024, the annual intercollegiate symposium organized by IEEE SIESGST, successfully concluded its fourth edition from September 14th to 16th, 2024. This year's theme, "Synergy of Realities," highlighted the integration of AR/VR, Digital Twins, Autonomous Vehicles, and NeuroBytes paving the way for discussions on cutting-edge innovations that bridge the gap between the physical and digital worlds.

Epsilon 2024 featured a dynamic combination of talk sessions, hands-on workshops, and panel discussions led by renowned international speakers and industry experts. The symposium provided students with a platform to explore new technological trends, engage with experts, and gain practical insights into emerging domains.

#### **Key Tracks and Topics**

- 1. Computer Society (CS)- AR/VR in Digital Twins
  - Exploring simulation-based decision-making
  - Applications in healthcare, manufacturing, and energy
  - Hands-on 3D modeling and visualization with Unity
  - Ethical considerations in AI-driven digital twin systems
- 2. Women in Engineering (WiE) NeuroBytes Revolution
  - Introduction to neuromorphic computing
  - Building and simulating spiking neural networks (SNNs)
  - Future trends and ethical concerns in human-machine integration

#### 3. Microwave Theory & Techniques Society (MTT-S) - Future of Autonomous Vehicles

- Advancements in LiDAR sensor technology
- Sensor fusion techniques for self-driving cars
- Ethical challenges and data privacy in autonomous navigation

The symposium was honored to host distinguished speakers, including researchers from ISRO, PhD scholars from prestigious institutions, and professionals from global tech companies. Some key speakers included:

- JayKumar Goswami Robotics Engineer, Northeastern University
- Dr. Siona Menezes Picardo Expert in Neuromorphic Computing
- Amrut Mujumdar XR & Digital Twin Researcher
- Pierpaolo Vergati Digital Transformation Specialist
- Saurabh Kumar Autonomous Vehicle Specialist at Qualcomm





DAY 3

#### **TECHOPEDIA 13:**



Techopedia 13 was the flagship national-level technical fest organized by IEEE SIESGST, showcasing a blend of innovation, competition, and collaboration. Held over three exciting days, the event featured a diverse range of competitions, hands-on workshops, and expert talks, aligning with this year's theme, "Multiverse: Nexus."

The fest brought together over 600 participants from various institutions, engaging in challenging competitions such as:

The event also featured renowned speakers and industry experts, offering insights into emerging technologies, AI, cybersecurity, and entrepreneurship.

### **TECHOPEDIA 13:**



#### SQUABBLE

It is a National-Level Debate Competition that provides a platform to showcase exceptional oratory skills with a focus on technical perspectives. The event features group discussions and one-on-one debates conducted within time constraints. Participants have the opportunity to present their views on the future, exploring various dimensions, including technological advancements, socio-economic impacts, and cognitive developments shaping the millennium ahead.

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#### **TECHOPEDIA 13:**

#### **INQUISITIVE:**

It is a National level Quiz Competition where the participants will get to validate their cerebral capacity by engaging in a quiz on the occurrences, technologies, advancements, and affairs of the present time. It is an attempt to provide a platform to all the participants throughout the nation to boost their technical knowledge.









#### EUREKA:

A National-Level Ideathon focusing on real-world issues where participants craft innovative solutions and deliver compelling presentations. From addressing social challenges to proposing technological advancements, Eureka ignites creativity and provides a stage for transformative ideas.





### **TECHOPEDIA 13:**



#### **GEARSTIKE:**

Gearstrike is a thrilling 3v3 team deathmatch where teams earn points through kills and hidden items. Battling in a multiverse-themed arena, players compete to collect shard replicas that temporarily stabilize their universe. With tie-breaking 1v1 duels, Gearstrike combines strategy, teamwork, and high-stakes action.



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#### **TECHOPEDIA 13:**

#### **ECHOES OF INFINITY:**

Is an exciting event where participants solve puzzles across three rounds to save the multiverse. From navigating the Tech Maze and decoding binary in Ciphertext to solving riddles and cracking passwords in the final round, this event combines strategy, innovation, and thrilling challenges.





### IEEE SIESGST COUNCIL WALL 2023-24



### IEEE SIESGST COUNCIL WALL 2023-24



## PHOTO GALLERY







## PHOTO GALLERY





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## PHOTO GALLERY





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### FROM THE EDITOR'S DESK



Technozine '24 is more than just pages filled with words and pictures it's a reflection of the energy, passion, and dedication that define IEEE SIESGST. It tells the story of a year filled with innovation, collaboration, and the relentless pursuit of growth.

Being part of the editorial team has been an incredible journey. From capturing the highlights of our events to ensuring every achievement gets the spotlight it deserves, we've worked to create something that truly represents the spirit of our community. This magazine is our way of preserving the moments that made this year special, a time capsule of everything we've built together.

None of this would have been possible without the unwavering support of our mentors, who guided us at every turn, and the enthusiasm of our peers, who constantly pushed boundaries and brought fresh ideas to the table. The late nights, the endless edits, and the collective effort have all led to this the final product we're proud to share. As we turn this page and look ahead, we carry forward the lessons, the friendships, and the drive to keep creating. Here's to new challenges, new successes, and the journey ahead!

> ~ Persis Bincy, Secretary Dona Manoj, and Naeem Parkar Joint-Secretaries

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# TECHNOZINE

#### THE YEARBOOK OF IEEE SIESGST



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