TECHPULSE

2025

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SLIIT IEEE Student Branch

SLIIT IEEE Student Branch
A Student chapter of IEEE Industry Applications Society

WELCOME

Welcome to the premier issue of the IEEE Industry Applications Society (IAS) Student Branch Chapter of SLIIT magazine, TECHPULSE. We are proud to present
this first edition, a key milestone that brings together our collective passion for
technology, learning, and positive change.

Within these pages, you'll discover stories and features that weave together themes of education, nature, ethics, and equality - all united by the transformative power of
technology. This magazine also showcases three exclusive interviews with inspiring individuals and five vibrant event spotlights, each illustrating the chapter's dynamic influenceand achievements.

As you read, we invite you to celebrate with us the spirit of innovation, collaboration, and leadership that defines our community.
Here's to celebrating fresh starts and the incredible support that made this possible!

Message from the Chairperson of IEEE Student Branch of SLIIT

As the Chairperson of the IEEE Student Branch of SLIIT, it fills me with immense pride to reflect on the journey of the IEEE IAS Student Branch Chapter (SBC) of SLIIT under the strong guidance of its Chairperson. What makes this chapter truly special is not just its milestones, but the passionate volunteer community that drives every success.

A highlight this year was achieving the highest IAS student membership count in Sri Lanka, a proud achievement that reflects the dedication and unity of our team. With new initiatives underway, I'm confident this momentum will continue to grow.

The strength of collaboration between the IAS SBC and the IEEE Student Branch has been evident through various events, along with joint efforts involving other SBCs and university chapters. It's been inspiring to see this chapter thrive through impactful events and partnerships.

To the Executive Committee, you've truly grabbed the opportunities given and acted on them. I wish you all continued success and encourage everyone to carry this legacy forward with enthusiasm and commitment

Mahdy Abdullah
Chairperson – IEEE Student branch of SLIIT (2024/25)

Message from the Chairperson of IEEE IAS Student Branch Chapter of SLIIT

It is with great pride that I share this message as the Chairperson of the IEEE IndustryApplications Society Student Branch Chapter of SLIIT for the 2024/25 term.

This magazine is more than a record of achievements, it's a celebration of the passion, purpose, and perseverance that define our chapter. From technical workshops and bootcamps to projects bridging academia and industry, our journey this term has been driven by a team committed to meaningful impact.

We've focused not only on growing in numbers but also on creating space for innovation, inclusivity, and leadership through volunteerism. Each step forward was possible thanks to the energy and dedication of our volunteers, mentors, and partners.

A special note of appreciation goes to the IEEE Student Branch of SLIIT, whose continued support has been instrumental. The synergy between our Organizational Units, shaped by the thoughtful leadership of its Chairperson, has quietly strengthened our shared vision.

As we turn this new page with our first magazine, may it inspire you to reflect, connect, and contribute to what lies ahead.

Hafsa Zainab Kaleelur Rahuman
Chairperson – IEEE IAS SBC of SLIIT (2024/25)

Message from the Secretary - IEEE IAS Student Branch Chapter of SLIIT

Stepping into the role of Secretary for the IEEE IAS Student Branch Chapter of SLIIT has beenone of the most meaningful parts of my university journey so far. It's not just about organizing documents or planning events; it's about being part of a team that truly believes in creating something valuable for others.

This year, we worked hard to make our chapter more than just active, we wanted it to be impactful. Every workshop, discussion, and initiative were backed by hours of planning, teamwork, and the belief that even small efforts can create lasting change. I've had the chance to work closely with some incredible people, and I've learned so much not just technically, but about leadership, patience, and purpose.

I'm proud of what we've achieved together, and even more excited about where we're headed. A huge thank you to the committee, our volunteers, and the supportive IEEE SB team for always showing up and giving your best.

As you go through this magazine, I hope you not only see the events and highlights but also feel the passion and effort behind it all. And if you've ever thought of getting involved, I hope this inspires you to take that first step.

Pasindi Parindya Rathnaweera
Secretary – IEEE IAS SBC of SLIIT (2024/25)

Digital Education: A Global Perspective on EdTech Integration

Digital education has emerged as a pivotal component of modern learning systems worldwide, driven by rapid technological advancements and the pressing need for adaptable learning models. The global significance of digital education is underscored by the United Nations' Sustainable Development Goal 4, which explicitly references technology in six of its ten targets, highlighting its role as an input, delivery method, skill, planning tool, and social context provider[1].

In practice, digital tools have become ubiquitous in classrooms and online environments. Over the past two decades, a vast number of students, educators, and institutions have adopted digital learning platforms. For instance, massive open online courses (MOOCs) experienced exponentialgrowth, with enrollments rising from zero in 2012 to approximately 220 million by 2021 [2]. Language learning applications like Duolingo averaged 20 million daily active users in 2023, and online encyclopedias such as Wikipedia received over 240 million page views per day in 2021 [2]. Prominent online course providers like Coursera reported over 100 million registered learners globally [3]. These trends illustrate the expansive reach of online learning, facilitated by the dramatic increase in global internet usage from 16 percent of the world's population in 2005 to about 66 percent in 2022 and the fact that by 2022, roughly half of the world's secondary schools had internet connectivity for teaching purposes [2].

Education technology, commonly referred to as EdTech, encompasses a broad spectrum of tools and platforms designed to enhance teaching and learning. Learning management systems, adaptive tutoring programs, virtual laboratories, educational games, and open content platforms have become increasingly prevalent. Digital platforms enable widespread content sharing, and open educational resources (OER) can significantly reduce costs for learners and institutions. For example, the U.S. state of North Dakota saved over USD 1 million in textbook expenses after investing approximately USD 110,000 to transition to OER materials [4].

Interactive multimedia, including video lectures and virtual reality (VR) simulations, contribute to creating engaging learning experiences. Research indicates that immersive VR can substantially

improve student engagement and learning outcomes. A 2024 review found that classroom VR applications typically enhance cognitive and behavioral engagement and are particularly effective for students with learning disabilities, although they necessitate considerable teacher training and student digital literacy [5]. The proliferation of artificial intelligence (AI) has introduced capabilities such as personalized tutoring, automated grading, and language translation. UNESCO notes that breakthroughs in AI have amplified the effectiveness of EdTech tools, prompting discussions about AI potentially supplementing certain human interactions in teaching [6].

Institutions are increasingly utilizing data analytics to monitor learning progress, and many contemporary applications employ algorithms to customize content according to each learner's proficiency level. Social media and collaborative tools facilitate interaction between students and teachers across distances, while mobile devices provide access to educational resources even in remote areas.

Despite the promising advancements, the impact of digital education has been uneven. In affluent countries and well-resourced schools, technology integration is often seamless. A 2018 OECD study revealed that approximately 65 percent of 15-year-old students in OECD schools had teachers confidence in using digital devices, and 54 percent had access to effective online learning platforms [2]. The COVID-19 pandemic necessitated a swift transition to online learning globally, effectively transforming the world into a large-scale experiment in digital education [2]. Higher education institutions adopted digital modalities as campuses closed, with many universities shifting to online or hybrid models. Students worldwide also engaged in informal learning opportunities via the internet.

However, significant disparities persist. Many disadvantaged learners lack access to essential devices, reliable internet, or even electricity at home. UNESCO highlights that digital resources are predominantly concentrated among wealthier households, leaving poorer students less likely to own computers or tablets and to be online [7]. This digital divide exacerbated existing educational inequalities during the pandemic, with approximately 500 million students about 31 percent globally being completely unreachable by remote learning, predominantly from impoverished and rural communities [4]. Even considering radio, television, and mobile phone initiatives, only about one quarter of students worldwide could be reached through the online systems established by countries [4]. These challenges have prompted governments and organizations to prioritize inclusivity. UNESCO and its partners launched the Rewired Global Declaration on Connectivity for Education, a roadmap aimed at ensuring that connected technologies advance inclusive education based on principles of equity and human rights [8]. Many nations have implemented policies to expand internet access; for instance, about 85 percent of countries now have policies targeting school or learner connectivity, and over a third have laws aiming for universal internet service [9]. Such initiatives have led to improvements in countries like Kyrgyzstan and Costa Rica, where negotiated agreements and subsidized programs significantly reduced broadband prices and decreased the rate of unconnected households from 41 percent to 13 percent within a few years [9].

Nevertheless, substantial digital literacy gaps remain, even within connected communities. UNESCO notes that many teachers have limited training in effectively utilizing technology, and that technical and pedagogical skills for digital instruction are not universally present across schools [7]. A new concern arises with the advent of advanced technologies: some analysts warn of an emerging AI divide, cautioning that marginalized groups including women, minorities, and the poor may not equally benefit from advancements like AI-driven tutoring unless AI literacy is addressed at the community level [10].

Despite these challenges, the potential benefits of EdTech continue to drive innovation. Countries and institutions are responding with various policies and organizational strategies. Numerous education ministries have adopted national digital learning strategies that emphasize expanding infrastructure, training educators, and developing digital curriculum standards. UNESCO and other multilateral organizations have facilitated stakeholder dialogues; for example, in 2023, UNESCO convened over 40 education ministers for a global summit on AI in education,

emphasizing the need to integrate new technologies with attention to ethics, inclusion, transparency, and safety [11].

At the institutional level, some governments provide devices to students or implement bring your own device programs, while others promote open-source software to reduce costs [9]. Support for open educational resources and digital libraries aims to lower content expenses and tailor materials to local contexts. However, UNESCO reports that evidence on the effectiveness of many EdTech tools remains limited, with surveys indicating that most popular applications and platforms lack rigorous evaluation [9]. This has led to calls for enhanced research and regulation, emphasizing that technology use in education should support clear learning objectives and avoid disadvantaging marginalized learners [2] [8].

Emerging technologies like AI, VR, and augmented reality (AR) are increasingly featured in educational strategies. AI-driven tools are already employed for automated grading, language translation, and adaptive practice exercises. Generative AI, such as ChatGPT, presents both opportunities and challenges for learning. It can generate personalized content or learning companions but also raises concerns about accuracy, bias, and academic integrity. UNESCO's recent work underscores the necessity of building AI literacy by educating students and teachers on understanding and responsibly using AI [10] [11].

Immersive media are also making inroads into classrooms. VR headsets can simulate laboratory experiments or historical environments more cost effectively and safely than real life scenarios, while AR can overlay digital information onto physical surroundings. Research suggests that these tools can enhance learning engagement. As previously noted, VR tends to increase student motivation and engagement when effectively integrated [5]. However, these advanced technologies remain relatively expensive and require robust infrastructure, limiting their impact to well-funded settings. Global analyses, such as those by the OECD, suggest that technologies including AI can improve education by enabling more personalized, inclusive, and efficient learning, but only if managed as part of a comprehensive digital transformation of education systems [12] [11].

In conclusion, the landscape of digital education is rapidly evolving. Online platforms and EdTech offer the promise of extending learning opportunities, customizing instruction to individual needs, and fostering new forms of collaboration. However, historical experiences caution against underestimating the challenges of equitable access, teacher training, and pedagogical integration [2] [7]. The COVID-19 pandemic highlighted both the potential and the pitfalls of digital education, necessitating a deliberate and inclusive approach moving forward. Emphasizing robust digital ecosystems that ensure reliable connectivity and devices for all students, equip educators with necessary skills, and evaluate tools for quality and privacy is essential. When thoughtfully implemented, this approach can help realize the vision of education for all in the 21st century.

Contributing Writer: Ruwani Hewage

A Greener Tomorrow: How Sri Lanka Could Become the Island That Runs on Sunlight and Innovation

In the year 2035, a flight descends into Colombo under a sky buzzing with silent electric drones. The buildings below shimmer with solar glass windows, and the streets hum softly with electric tuk-tuks weaving through lanes lined with vertical gardens. In this imagined future, Sri Lanka has become a beacon of green innovation, a self-sustaining island powered almost entirely by the wind, sun, and waves. But this isn't science fiction. This is the path we could take, starting now.

Today, Sri Lanka faces a critical crossroad. The country spends billions importing fossil fuels, only to battle rising fuel prices, power cuts, and pollution. Meanwhile, we're blessed with what many countries crave, year-round sunlight, strong ocean currents, and vast wind corridors. It's as if nature is handing us the blueprint for clean energy; we just need to read it.

Green technology isn't just about solar panels and wind turbines anymore. It's about smart grids that talk to each other, bioengineered algae that produce fuel, and transparent solar films that turn every window into a mini power station. Germany, a country with far less sunlight than Sri Lanka, now generates nearly half of its electricity from renewable sources [1]. If they can do it, imagine what we can achieve, with over 2,800 hours of sunshine a year!

One of the most inspiring real-world stories comes from the small village of Galgamuwa, where a community-led solar project lights up schools, homes, and farms. No grid connection, no diesel generators, just the sun and a vision. Multiply that across thousands of villages, and you have a grassroots energy revolution. According to a 2022 study from the Asian Development Bank, decentralized solar microgrids can cut rural poverty by up to 40% in energy-deprived communities [2].

But green tech goes beyond just power. Picture this: algae-based biofuel plants along the coast, turning seawater and sunlight into jet fuel. Roads made of recycled plastic infused with solar cells, powering streetlights. Schools cooled with rooftop gardens and rainwater-fed air

circulation systems. These ideas may seem futuristic, but companies around the world are already piloting them—and Sri Lanka has the perfect climate, talent, and urgency to bring them home.

One of the most overlooked treasures we have is ocean energy. Sri Lanka's coastline stretches over 1,300 km, offering immense potential for wave and tidal power. Countries like Scotland are already harnessing ocean currents using submerged turbines. If even a fraction of our marine energy were tapped, it could supply uninterrupted electricity to the island, particularly during monsoon seasons when solar efficiency drops [3].

Transportation is another opportunity dressed as a challenge. Imagine transforming Sri Lanka's iconic tuk-tuks into electric vehicles powered by solar-charging stations placed at every major bus stop. With proper policies and incentives, we could phase out fossil fuel vehicles by 2040, slashing emissions and boosting the local EV market. Already, several Lankan startups are working on low-cost, solar-powered electric bikes and three-wheelers, but they need visibility and support.

The potential is there. Technology is here. What's missing? Vision and bold leadership. Government policies must incentivize clean energy investments, reduce taxes on green tech imports, and promote public-private partnerships. Universities must offer programs that blend engineering with sustainability. Citizens must demand change, not with protests, but with purchasing power, education, and innovation. As per the International Renewable Energy Agency (IRENA), every dollar invested in renewable energy generates three times as many jobs as fossil fuel investments [4]. That means clean energy doesn't just save the planet, it grows the economy.

Sri Lanka is not too late to lead. In fact, we are just early enough to leap ahead. Let's imagine a Sri Lanka where every rooftop is a power plant, every bus is electric, and every drop of rain is captured and reused. Where our children breathe cleaner air, our farmers grow with smarter tools, and our cities glow without burning carbon. The green revolution isn't coming, it's already here. And this tiny island, full of sunshine and possibility, might just be the unexpected hero the world needs.

Contributing Writer: Ruwani Hewage

Surveillance Capitalism: The Rise of Data-Driven Power

Surveillance capitalism refers to an economic system where businesses collect, analyze, and sell personal data to generate profit. This model depends on the constant tracking of people's behaviors, habits, locations, and preferences, mostly through the digital devices and platforms they use every day. These include smartphones, social media platforms, smart home devices, and search engines. Most of the time, this tracking happens without full awareness or informed consent from users [1]. The concept was introduced by Harvard Professor Shoshana Zuboff, who described it as the unilateral claiming of private human experience as free raw material for commercial practices [2]. While the term may sound complex, the basic idea is simple. Whenever someone uses a service like Google, Facebook, or a navigation app, they provide personal information. This data is not just used to improve services but also turned into prediction products that are sold to advertisers and other entities [2].

One of the clearest examples of surveillance capitalism in action can be seen in the way social media platforms operate. Platforms such as Facebook, Instagram, and Twitter track nearly everything users do. They collect information about likes, shares, friend connections, personal messages, and even the time spent looking at each post. This data is used to build detailed psychological profiles that allow companies to show highly targeted advertisements. A major scandal highlighting this issue was the Cambridge Analytica incident. In 2014, a researcher created a personality quiz app on Facebook that collected data not just from users who installed it but also from their friends. As a result, data from around 50 million profiles was harvested and used to influence political campaigns [3]. This exposed how easily data collected under the guise of entertainment or convenience can be repurposed for manipulation.

Smartphones are another central tool in surveillance capitalism. Apps routinely ask for access to sensitive data like location, contacts, and call logs. Users often grant these permissions without reading or understanding them. In 2018, The New York Times investigated and found that several mobile apps were collecting location data from millions of users, often updating their location every few seconds [4]. This data was then sold to advertisers, data brokers, or analytics companies. Even basic apps like weather widgets or mobile games were found to be sharing precise user locations. While such information may be used to

improve user experience, for example by showing local weather updates, the extent and frequency of data collection go far beyond what most users would consider reasonable [4]. Another rising aspect of surveillance capitalism comes from smart devices found in homes. These include voice assistants such as Amazon Alexa and Google Assistant, smart TVs, and even smart fridges. These devices constantly listen for commands and may upload recordings to cloud servers for processing. In some cases, these audio files were stored for years and analyzed by human reviewers for product improvement. A recent case involved the United States Federal Trade Commission taking legal action against Amazon for retaining children's voice recordings and location data for extended periods through its Alexa product. Even when parents tried to delete the data, the company did not fully comply with [5]. This situation showed how smart home devices can collect sensitive data over long periods, often with limited transparency or control for users.

Cities are also becoming part of the surveillance capitalism network through the rise of smart city initiatives. These projects install sensors, cameras, and tracking systems to collect data on traffic, air quality, electricity usage, and citizen behavior. In theory, this can help governments improve services. However, when managed by private tech companies, the data collected becomes a commercial asset. A notable example is the Sidewalk Toronto project, led by Google's Sidewalk Labs. The plan was to build a technologically advanced neighborhood using sensors embedded in roads, buildings, and public spaces. Critics raised concerns that residents and visitors would be constantly monitored without a clear understanding of who owned the data or how it would be used [6]. Eventually, the project was canceled, but it remains an important case showing the risks of private sector involvement in public data collection.

Globally, surveillance capitalism has spread rapidly. In the United States, the business model thrives due to a lack of strong federal privacy laws. Companies are largely free to collect and trade personal data as long as they do not lie about their practices. In contrast, the European Union has taken a stricter approach. The General Data Protection Regulation, known as GDPR, gives people more control over their data and requires companies to be transparent about what data they collect and why. In 2023, Meta Platforms, the parent company of Facebook, was fined 1.2 billion euros for transferring personal data of EU citizens to the United States in violation of the GDPR [7]. European regulators argue that people should have the right to know and decide how their data is used.

Other regions have different responses. In China, the government and companies engage in extensive data collection, which is often justified for reasons of national security and social management. Citizens are monitored using facial recognition and digital payment systems, sometimes as part of social credit programs. In India, digital services like Aadhaar and UPI have expanded access to banking and government services but raised concerns about privacy due to large-scale biometric data collection. In many parts of Africa and Latin America, weak regulation means that global tech companies operate freely, leading to concerns about data colonialism where foreign firms extract value from local populations without returning benefits [8].

Surveillance capitalism also poses serious threats to democracy and individual freedom. When companies can predict behavior, they can also influence it. Furthermore, when people know they are being watched, they may change their behavior, becoming more cautious or conformist. This kind of self-censorship undermines freedom of expression and creativity [9]. In recent years, public awareness about digital privacy has grown. Movements and campaigns have emerged around the world demanding stronger data rights. Some people have started using privacy-focused apps, browsers, and search engines to limit data collection. However, opting out completely is very difficult in modern life. Most services are designed in a way that makes data sharing the default. Users must often accept lengthy terms and conditions just to access basic functionality.

For students in information technology, understanding surveillance capitalism is essential. It is not just a business or policy issue but a technical one. Every system or app built today has the potential to collect and store user data. Developers must think carefully about what data is needed, how it is stored, and how it is protected. Transparency, consent, and user control should be key

principles in system design. At the same time, governments and institutions must continue working on legal
frameworks that can protect individuals while allowing innovation to continue.

In conclusion, surveillance capitalism is a global challenge that affects everyone who uses digital technology. It began with online advertising but has expanded into every area of life including healthcare, transportation, and urban living.

While there are benefits to personalization and efficiency, they must be balanced with privacy and human rights. Regulation, ethical design, and public education will all play important roles in shaping the future of data collection. By understanding the foundations of surveillance capitalism and its impact, young technologists and citizens alike can contribute to building a more just and transparent digital world.

Contributing Writer: Arudkumaran V.

The New Frontiers of Healthcare: How AI is Revolutionizing Medical Diagnostics

In the fast-evolving intersection of technology, industry, and medicine, Artificial Intelligence (AI) stands as one of the most groundbreaking innovations of our time. No longer confined to administrative tasks or experimental research, AI is now at the core of how healthcare providers diagnose diseases, design treatments, and predict patient outcomes. From hospital fltoors to remote telemedicine centers, the integration of AI into diagnostics is setting new standards for accuracy, efficiency, and personalized care, redefining the future of medicine as we know it.

The Rise of Intelligent Diagnostics

In the early stages, AI in healthcare was primarily focused on handling paperwork, managing schedules, and automating repetitive tasks. However, today's AI technologies, powered by advanced machine learning and deep learning algorithms, are capable of analysing complex datasets at a scale and speed unimaginable to human clinicians [1]. These systems can sift through millions of medical images, patient histories, and genetic profiles in seconds, identifying subtle patterns that would likely eludeeven the most experienced specialists. Medical imaging has been one of the earliest beneficiaries. AI-driven tools now outperform human radiologists in certain diagnostic tasks, such as detecting breast cancer in mammograms by highlighting microscopic anomalies with greater precision and consistency [1]. In burn and wound care management, AI algorithms assess infection risks, monitor healing progress, and even predict surgical needs, drastically improving patient outcomes [2].

Speed and Precision: A Life-Saving

Time is often the most critical factor in disease diagnosis. Traditional diagnostic methods, while accurate, can sometimes be slow due to the manual analysis required. AI tools are changing this dynamic by offering near-instantaneous assessments. For example, in burn and wound management, AI systems evaluate the depth and severity of injuries from high-resolution images in real time [2]. These rapid analyses are particularly vital in emergency settings where

early intervention can mean the difference between recovery and severe complications.

Predictive analytics, a branch of AI, is also gaining momentum in preventive medicine. By analysing variables like patient demographics, comorbidities, lifestyle factors, and treatment histories, AI models can forecast the likelihood of disease progression or healing outcomes [2][3]. This empowers clinicians to design proactive, personalized treatment plans rather than reactive ones, a shift that promises to reduce healthcare costs and enhance patient satisfaction across the board.

A New Era of Personalized Medicine

One of AI's most promising contributions to healthcare is its ability to personalize medicine at an unprecedented level. Gone are the days of one-size-fits-all treatment strategies. AI algorithms now tailor healthcare plans based on each patient's unique genetic makeup, environmental exposure, and medical history [1]. For instance, platforms like DeepView® are already transforming wound care diagnostics by predicting wound healing trajectories with astonishing accuracy, allowing clinicians to intervene earlier and more effectively [3].

This personalization extends beyond individual treatment plans. AI can stratify patients by risk, prioritize resources, and even identify the most promising candidates for clinical trials, accelerating medical research and innovation [2].

Industrial Impact: AI and the Business of Healthcare

The integration of AI into diagnostics is not just reshaping medicine; it is also transforming the healthcare industry itself. Hospitals and clinics are rapidly adopting AI platforms to improve operational efficiency, reduce diagnostic errors, and meet the rising demand for precision medicine. Companies specializing in AI healthcare solutions, imaging technologies, and predictive analytics are witnessing unprecedented growth, drawing attention from venture capitalists, biotech investors, and tech giants alike [1][2].

Telemedicine has become another major frontier. With AI-enhanced diagnostic tools, remote consultations have become more reliable and urate, enabling patients in rural or underserved areas to receive high-quality care without the need to travel [3].

Challenges and the Road Ahead

Despite these remarkable advancements, challenges remain. Integrating AI systems into traditional healthcare infrastructures requires significant investment in technology, training, and cybersecurity measures to protect sensitive patient data [1]. Additionally, ethical and regulatory frameworks must evolve quickly to keep pace with AI's capabilities, ensuring that these powerful tools are used responsibly and equitably [1][2].

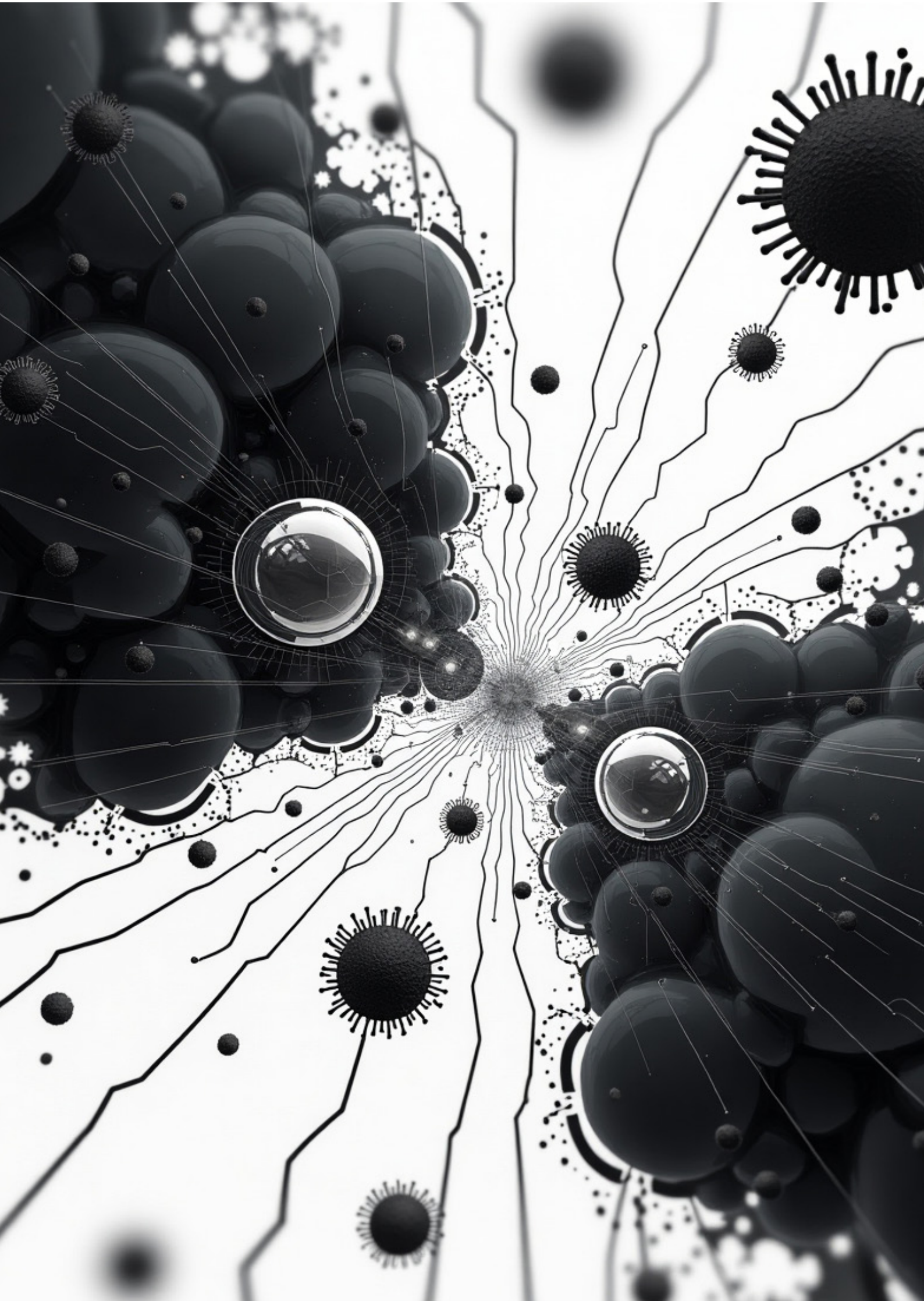
Moreover, while AI can augment and accelerate human decision-making, it cannot yet replace the essential intuition, empathy, and contextual judgment that clinicians bring to patient care. The best outcomes will come from a synergy of human expertise and machine intelligence, rather than competition between the two.

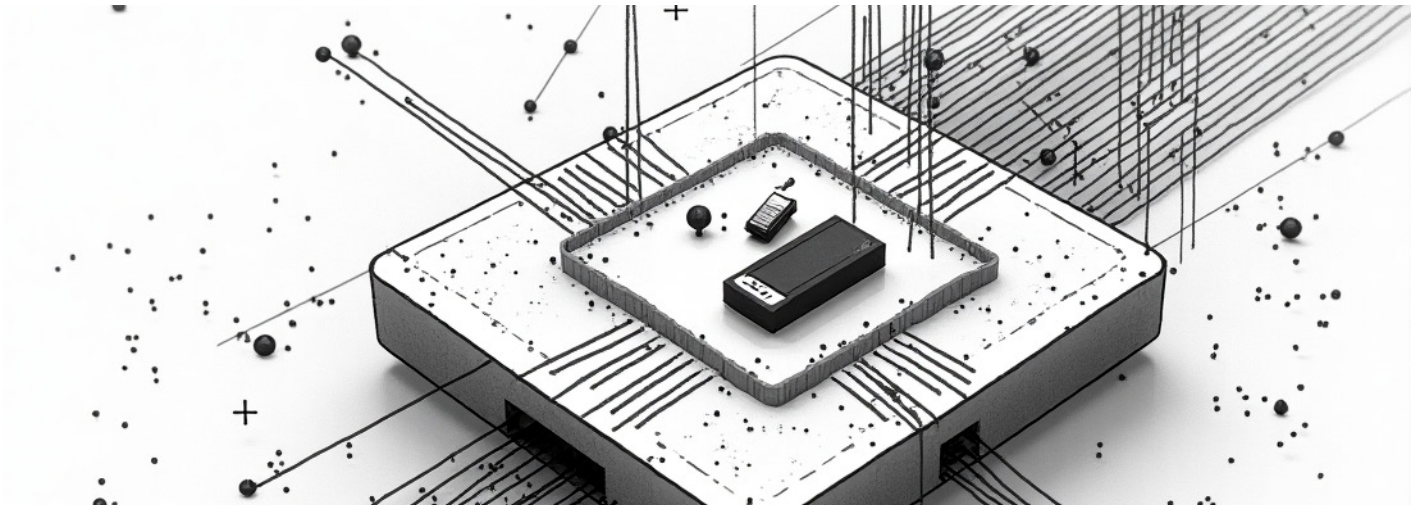
Conclusion: Embracing the Future

Artificial Intelligence is not merely a tool of convenience in modern healthcare, it is a transformative force redefining what is possible. From diagnosing cancer earlier than ever before, to predicting wound healing outcomes, to crafting individualized care plans, AI is making medicine more precise, proactive, and patient-centered.

As AI technologies continue to evolve, healthcare providers, industries, and governments must work together to ensure that these innovations are accessible, ethical, and sustainable. The future of diagnostics, and healthcare at large-is intelligent, interconnected, and incredibly promising. Those who embrace this revolution today will lead the way to a healthier, more resilient world tomorrow.

Contributing Writer: Ruwani Hewage





The Nano Leap: How Tiny Tech is Set to Revolutionize Sri Lanka's Future

Imagine a world where diseases are cured at the molecular level, crops grow smarter, buildings heal themselves, and clothes can clean the air you breathe. Sounds like science fiction, right? Not anymore. This is the world of nanotechnology, a field of science and engineering that manipulates matter at the atomic scale to create powerful, intelligent solutions. Globally, nanotech is already making waves. But here's the exciting part: Sri Lanka is uniquely positioned to ride this tiny wave toward a massive transformation across

In healthcare, for example, scientists have developed nanobots so small they can navigate the bloodstream, targeting and destroying cancer cells without harming surrounding tissues. Unlike traditional chemotherapy, this approach is precise, reducing side effects and improving patient recovery. A recent study even showed how nano-scale machines could be activated by light to drill into cancer cells directly [1]. Imagine the impact if Sri Lanka's hospitals could access such advanced, minimally invasive treatments. The cancer and tuberculosis, could be tackled in ways never before possible. The National Institute of Fundamental Studies (NIFS) in Kandy has already begun exploring the medical uses of Sri Lanka's naturally abundant minerals to develop nano-based drug delivery platforms [6].

But healthcare is just the beginning. Agriculture, Sri Lanka's economic backbone, is also ripe for nano-intervention. With farmers often facing unpredictable weather, pests, and low yields, nanotechnology offers a smarter way forward. Nano-fertilizers and nano-pesticides can release nutrients and protection exactly when and where crops need them, leading to higher yields with fewer chemicals. This not only boosts productivity but also safeguards our ecosystems. A 2023 research collection on precision agriculture highlighted how nanoparticles improve soil health, reduce environmental waste, and help plants become more resilient to climate change [2]. For a country aiming for food security while fighting land degradation, this could be a game-changer.

Let's talk about energy. The world is racing toward renewable solutions, and nanotechnology is helping lead the charge. In solar power, for instance, quantum dots and graphene-based nanomaterials are being added to solar panels to capture more sunlight and convert it into electricity more efficiently [3]. Sri Lanka, blessed with sunlight all year round, could integrate these enhanced solar technologies to build a cleaner, more affordable energy future. Imagine villages powered entirely by rooftops infused with nanotech-enabled panels-off-grid, sustainable, and smart.

The construction industry is next in line. Picture cement infused with nanoparticles that makes buildings stronger, lighter, and more resistant to natural disasters. In a tropical country like Sri Lanka, where humidity, salt corrosion, and storms can reduce the lifespan of infrastructure, nano-engineered materials could be the key to safer, longer-lasting buildings. Some innovations even include self-healing concrete that fills in cracks on its own using embedded nanocapsules [4]. This could revolutionize how we think about public infrastructure, reducing maintenance costs and extending the life of roads, bridges, and buildings.

Even the clothes we wear are becoming smarter thanks to nanotech. Sri Lanka's thriving textile industry could be transformed by fabrics made with nanosilver or titanium dioxide, materials that make clothes antibacterial, UV-protective, water-repellent, and even capable of neutralizing pollution. Global fashion brands are investing heavily in these smart textiles, and Sri Lanka, as a leading garment exporter, could gain a competitive edge by adopting and producing these innovations locally [4].

And perhaps most importantly, nanotechnology offers powerful tools to protect the environment. From water purification to pollution control, nano-solutions are emerging as green alternatives to traditional methods. Nanomaterials can filter heavy metals from contaminated water or break down oil spills without harming marine life [5]. In a country surrounded by the ocean and rich in freshwater ecosystems, such innovations are not just useful; they're necessary. The NIFS is already studying how locally sourced graphite can be used to build energy-efficient water filtration systems [6].

All of this might sound like distant dreams, but the seeds of a nanotech revolution are already being planted right here in Sri Lanka. With institutions like NIFS leading the charge, and global research lighting the way, the nation has an opportunity to leap into the future. What's needed now is investment, education, and the courage to embrace innovation on the smallest yet most powerful scale imaginable.

Nanotechnology may be invisible to the naked eye, but its potential is colossal. For Sri Lanka, this is more than just a new technology, it's a new era. A chance to redefine industries, protect the environment, improve lives, and become a leader in science and sustainability. The nano-leap is here. The only question is: are we ready to take it?

Contributing Writer: Ruwani Hewage

Materials Science and Engineering: Pioneering a New Era of Technological Innovation in Sri Lanka

From local developments to global breakthroughs, Sri Lanka has the potential to be a rising hub in materials innovation.

In a world driven by smart materials and sustainable solutions, studying how materials interact with the environment isn't just a research topic; it is a key part of innovation. One such excellent example of how a simple yet extraordinary phenomenon influenced the world would be the lotus leaf effect. This phenomenon, scientifically termed the "hydrophobic effect", was the inspiration for the development of a wide range of water-repellent surfaces that you use! More products using this effect include self-cleaning windows, textiles and corrosion-resistant coatings. This branch of engineering brings together such interactions and other material properties to create better, more effective solutions in terms of materials. While the advancement of technology is rising globally, Sri Lanka itself is starting to take its first steps into the world of Materials Science and Engineering, with the goal of turning revolutionary research into technologies that can help island with its future development.

Materials Science and Engineering (MSE), shortly described, is a broad field that sums up the study of materials from at its atomic level behaviour, which lead to the development, design and production of new, enhanced materials to satisfy engineering requirements. It involves understanding the basic characteristics of materials and how to use them to produce better devices and products. The main categories of material that fall under the study in the MSE field are namely: metals, polymers, ceramics and composites. This branch of engineering is basically the foundation for everything else - it helps build all the physical materials that other fields rely on! Be it the engineering, agriculture, food, biomedicine, electrical, environmental, energy, textiles or automotive & aerospace field, MSE plays a fundamental role by enabling the design,

development, and optimization of materials essential to each field's advancement.

Materials Science and Engineering (MSE) has the chance to become a leading field in Sri Lanka, thanks to the country's unique environment and natural resources. Since agriculture is a big focus in Sri Lanka, there are many opportunities to apply MSE in useful ways. Specifically, agricultural byproducts, or the materials that are thrown away with no use, have the potential to be recycled as improved materials. Using these natural resources promotes new and creative material designs that fit local needs and help protect the environment, while supporting sustainable practices. A fitting example of MSE's impact is replacing dangerous materials with safer, locally available options. Asbestos, although widely used in construction, particularly in roofing materials, is a carcinogen, a substance that gives rise to cancer. Thus, it is raising significant health and environmental concerns. To solve this problem, researchers in Sri Lanka have investigated using agricultural waste like cornhusk, rice husk and bagasse (bamboo) fibres as eco-friendly alternatives to asbestos in cement sheets [cite]. In addition to providing a renewable and biodegradable alternative, these natural fibres, which are commonly found locally, help in the creation of environmentally friendly building materials that satisfy demands and standards. Research in this area can be extended to improved construction materials that are practical, cost-effective and sustainable. Such research conducted is on the use of cellulose fibres extracted from cornhusk residues to reinforce soil-based building materials, reducing damage to the material [cite]. Such examples reflect the vast area on which MSE can help Sri Lanka engineer towards a developed, innovative and sustainable future.

Sri Lanka's emerging developments in the field of MSE is fostered by many local institutions, which also sometimes collaborate with international ones for enhancing productivity and driving more effective, sustainable development. Some local institutions that actively contribute to the field include:

- University of Moratuwa (UoM)
- Centre for Advanced Materials Research (University of Sri Jayewardenepura)
- Sri Lanka Institute of Nanotechnology (SLINTEC)
- National Institute of Fundamental Studies

Other international collaborations include:

- University of Moratuwa and Queensland University of Technology (QUT)
- Access Engineering PLC and University of Moratuwa with UK Universities
- Sabaragamuwa University of Sri Lanka and Wuhan University of Technology

All these institutions are dedicated to advancing the field of MSE in Sri Lanka by promoting research, innovation, and education to support national development and technological progress.

Sri Lanka, being a developing nation, face a few challenges in promoting and upbringing of MSE. For instance, although Sri Lanka owns excellent minerals for high-tech applications, development has been disturbed by a lack of proper research on upgrading these resources [cite]. Adding value and promoting industrial growth require a focus on innovative materials and nanotechnology. Furthermore, modern facilities and equipment are generally lacking in many of the nation's research labs. The lack of research facilities and career growth in Sri Lanka makes it hard for institutions to meet international standards and do proper research [cite]. As a result, many skilled professionals look for jobs abroad. However, there are some good opportunities available for motivated students in the MSE field. Institutions like the Sri Lanka Institute of Information Technology (SLIIT), Malabe and the University of Moratuwa offer MSE degree programs for interested students. Institutions like NIFS also focus on developing the country's mineral resources to make the most out of the industry and support Sri Lanka's progress [cite]. Working in materials science and engineering can lead you to a vast range of career opportunities and roles, from improving production processes and developing new materials to analysing why components fail and designing products or equipment. Thus, MSE will offer a wide range of career opportunities for anyone who chooses to enter the field.

Materials Science and Engineering (MSE) has enormous potential to shape Sri Lanka's future as

a leading country for sustainable development and tech innovation. With the country's unique resources and environment, MSE can play a significant role in helping local industries grow. To fully develop this field in Sri Lanka, it's important to improve MSE education, raise awareness about the field, introduce students to research opportunities, and build strong connections with industries, both locally and internationally. These steps can help unlock the full potential of MSE, driving the country forward in terms of innovation, national growth, and a more sustainable economy. Despite challenges including limited infrastructure and resource constraints, through International collaborations, strategic investments, and institutional measures, Sri Lanka is progressively paving its way towards the future. The country could create new opportunities in industries including manufacturing, healthcare, energy, and environmental sustainability by embracing the revolutionary potential of MSE, which includes green technology and advanced materials. With sustained dedication and collaboration between sectors, MSE has the potential to lead Sri Lanka into a new age of scientific and technological advancement.

Contributing Writer: Lihini Wijesekara

The Rise of Data Science in Sri Lanka: Empowering Industries through Intelligent Insights

Data science has rapidly evolved from a niche discipline into a core driver of innovation across multiple sectors. In Sri Lanka, the integration of data science is gaining momentum, influencing domains such as agriculture, finance, healthcare, and public administration. Now, data science is being adopted in Sri Lanka carrying potential towards a data-driven future

The 21st century is defined by data. Every transaction, interaction, and digital footprint contributes to a growing ocean of information. Data science—an interdisciplinary field combining statistics, machine learning, and domain expertise—has emerged as the key to unlocking actionable insights from this data. In Sri Lanka, data science is moving beyond academia and IT labs, steadily making its way into the core operations of public and private institutions.

Agriculture remains a primary livelihood in Sri Lanka. With climate change threatening crop yields and traditional farming methods becoming less reliable, data science is helping farmers optimize planting cycles, forecast weather, and detect crop diseases using image recognition and IoT sensors. The Department of Agriculture has begun integrating satellite imagery and machine learning models to support smart farming initiatives. Further, hospitals in Colombo and Kandy are adopting predictive analytics to manage patient inflows, allocate resources, and even forecast potential disease outbreaks. Projects like AI-assisted diagnostics and patient risk profiling are being piloted using anonymized health data from government clinics. Leading banks in Sri Lanka are using data science for fraud detection, credit scoring, and personalized financial services. By analysing transaction histories and customer behaviour, banks are improving risk management while offering tailored product recommendations.

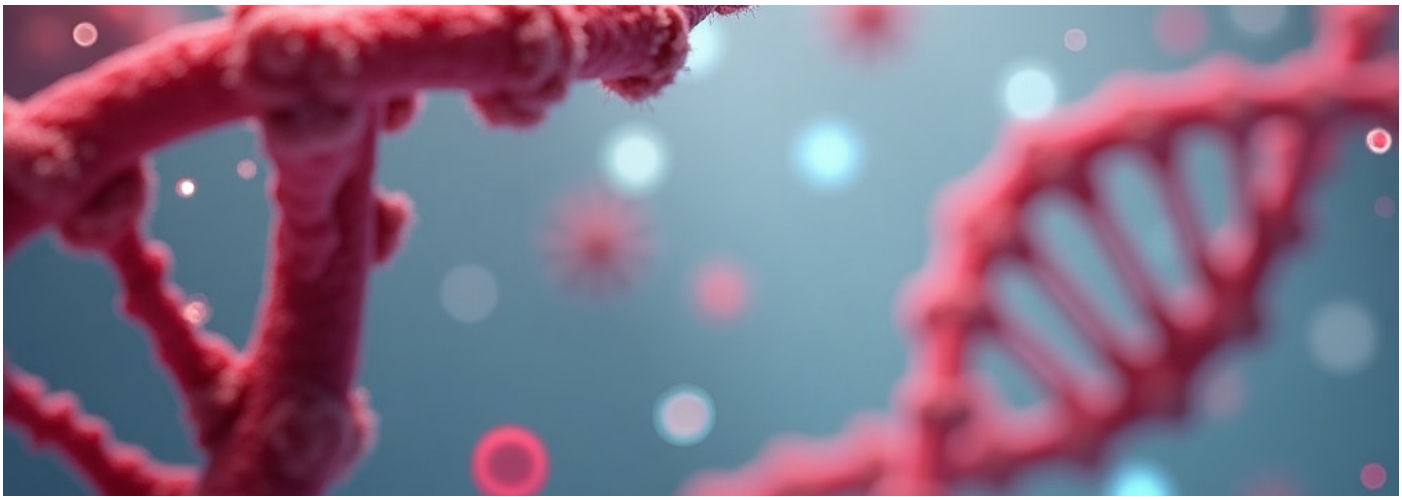
Universities such as SLIIT, University of Moratuwa, and University of Colombo have introduced specialized undergraduate and postgraduate programs in data science. These initiatives are nurturing a new generation of data

scientists equipped with practical knowledge in Python, R, SQL, cloud computing, and machine learning. Hackathons, data challenges, and research collaborations with industry partners are accelerating real-world exposure.

Despite its promise, the adoption of data science in Sri Lanka is not without obstacles. Key challenges include the quality of data. Inconsistent or unstructured datasets hinder model accuracy. Further, there is limited access to cloud computing and GPUs affects large-scale deployment. The demand for skilled data professionals still outpaces supply. Additionally, there is a growing need for clear data governance policies to protect citizen data.

The adoption of data science in Sri Lanka faces several significant challenges that impact its growth and effectiveness. A major obstacle is the quality and accessibility of data; inconsistent, incomplete, or unstructured datasets limit the accuracy and reliability of analytical models. Additionally, the country's digital infrastructure remains underdeveloped, with limited access to advanced cloud computing resources and GPUs, which restricts the deployment of large-scale data science projects. Another critical issue is the shortage of skilled data professionals, aggravated by brain drain and insufficient local training programs, which hampers the ability to meet rising industry demands. Furthermore, the absence of robust data governance frameworks raises concerns about data privacy and security, underscoring the urgent need for clear policies to protect citizen data and ensure ethical use. Addressing these challenges through improved infrastructure, education, and governance is essential for Sri Lanka to fully harness the potential of data science and AI technologies. Data science is not merely a technological trend; it is a transformative force that can redefine how Sri Lanka approaches its national priorities. By embracing data-driven decision-making, the country can unlock new efficiencies, drive inclusive development, and pave the way for innovation across all sectors.

Contributing Writer: Sandali Samarasinghe



CRISPR: The Genetic Scalpel Revolutionizing LifeInsights

Imagine a world where inherited diseases are erased before birth, where HIV is no longer a life sentence, and where food grows more abundantly without harming the environment. What once seemed like the realm of science fiction is now becoming reality, thanks to CRISPR-Cas9, a revolutionary gene-editing tool that is reshaping the boundaries of biology and medicine.

This technology, originally discovered as a bacterial immune defence system, has been transformed into a molecular scalpel that allows scientists to precisely cut and alter DNA. The possibilities it unlocks are extraordinary, and the stories emerging from its use are both thrilling and cautionary.

In 2018, the world was rocked by the announcement of the first CRISPR-edited human babies. Chinese researcher He Jiankui claimed to have modified the embryos of twin girls, Lulu and Nana, to remove a gene called CCR5, which is used by the HIV virus to infect cells. The goal was to make them resistant to HIV for life. The experiment, which bypassed international ethical guidelines and regulatory oversight, was met with global outrage. Yet, it undeniably marked the first time CRISPR was used to alter the human germline, with changes potentially passed on to future generations. While the long-term health and genetic consequences remain uncertain, this case thrust CRISPR into the public spotlight as both a miracle tool and a moral dilemma [1].

On a more hopeful note, CRISPR has been making headlines for its ability to cure devastating genetic disorders. One of the most inspiring examples comes from Victoria Gray, a woman in the United States who became the first patient to be successfully treated for sickle cell anaemia using CRISPR. Her doctors edited the gene in her bone marrow cells to turn back on fatal haemoglobin, a healthy alternative to the faulty adult version. Since her treatment in 2020, Victoria has been free from the debilitating pain crises and transfusions that once ruled her life. This single case has become a beacon of hope for thousands of others suffering from inherited blood disorders, proving that CRISPR can rewrite not just DNA, but destinies [2].

The power of CRISPR is also being explored in the global fight against HIV. Unlike traditional antiretroviral treatments that suppress the virus, CRISPR offers the radical potential to eliminate

it altogether. In a 2023 clinical trial in the U.S., scientists used CRISPR to target and remove latent HIV DNA hiding in the genomes of infected patients. Early results showed that in some individuals, the viral genetic material became undetectable after treatment, suggesting that a functional cure might be within reach [3]. While further trials and safety evaluations are needed, this could signal the beginning of a future where HIV is not just treatable, but curable. Beyond human health, CRISPR is already reshaping how we grow our food. In Japan, the first CRISPR-edited tomatoes were approved for sale in 2021. These tomatoes are engineered to produce higher levels of GABA (Gamma-Aminobutyric Acid), a natural compound believed to lower stress and blood pressure. Unlike genetically modified organisms (GMOs) that insert foreign genes, CRISPR allows for small, precise tweaks within the plant's own DNA. The result is a crop that looks, tastes, and behaves like any other tomato, except it's healthier and bred with pinpoint precision. These developments hold great promise for creating crops that are more nutritious, pest resistant, and climate-resilient without the baggage of traditional GMOs [4].

Even diseases of the mind may one day be within CRISPR's reach. In a recent 2024 study, researchers used CRISPR to target the APOE4 gene, a major genetic risk factor for Alzheimer's disease. In laboratory mice, editing this gene significantly reduced the buildup of amyloid plaques in the brain and improved cognitive performance. While these are early results and human trials are still in the planning stages, the potential to prevent or slow down Alzheimer's at the genetic level is groundbreaking. CRISPR could offer hope for millions facing a disease that has long remained untouchable by conventional medicine [5].

As CRISPR technology continues to evolve, its impact will ripple across every aspect of life, from curing illness and combating epidemics to feeding a hungry world and potentially extending the human lifespan. But with great power comes the need for caution, oversight, and ethical responsibility. The line between healing and enhancement, between innovation and interference, is thin and often blurry. Yet one thing is clear: CRISPR is not just a tool, it's a turning point. Humanity now holds the blueprint of life in its hands, and what we choose to do with it will define our future.

Contributing Writer: Ruwani Hewage

The Double-Edged Code: Ethics in the Age of AI and Biotechnology

We live in an age where machines can think, genes can be edited, and life itself can be redesigned. Artificial Intelligence (AI), biotechnology, genetic engineering, and data-driven science are reshaping what it means to be human. But with every new breakthrough comes a crucial question: should we do it, just because we can? The race to advance technology has never been faster but neither has the urgency to define its boundaries. The line between innovation and intrusion is thinner than ever and navigating that line is no longer just the job of scientists, it's a societal responsibility.

Take biotechnology and gene editing, for example. CRISPR-Cas9, the revolutionary tool that enables scientists to precisely alter DNA, has opened the door to curing genetic disorders like sickle cell anaemia and cystic fibrosis. Yet, the same technology can be used to engineer embryos, enhance intelligence, or increase physical traits raising the possibility of "designer babies" and superhumans. The infamous case of He Jiankui, the Chinese scientist who edited the genes of twin girls to resist HIV, sparked global backlash for violating ethical norms and disregarding long-term consequences. While the intentions may have been protective, the implications were profound: a precedent was set for altering the human germline [1].

In parallel, Artificial Intelligence is rewriting the rules of privacy, autonomy, and labour. AI-driven surveillance systems can recognize faces and track individuals without consent.

Algorithms can determine who gets a job interview, who receives a loan, or even who is flagged by law enforcement. In medicine, AI can assist in diagnostics and surgery, but also poses risks of bias, lack of accountability, and the replacement of human decision-making. AI systems trained on biased data can perpetuate social inequalities. The infamous case of COMPAS, an algorithm used in U.S. courts to predict recidivism, showed racial bias, disproportionately labelling Black defendants as high-risk [2].
Human cloning, once science fiction, is now technically feasible. In 2004, South Korean scientist Hwang Woo-Suk claimed to have cloned human embryos though later retracted due to fraud. Today, while therapeutic cloning (for stem cell research) is under cautious exploration, reproductive cloning remains banned in most countries due to ethical, identity, and dignity

concerns. The core issue lies in the commodification of life turning human existence into a customizable product. Would a cloned human be a full person with rights, or a creation subject to ownership? These are questions science cannot answer alone.

Global policies are gradually taking shape. The UNESCO Universal Declaration on the Human Genome and Human Rights (1997) asserts that the human genome is the heritage of humanity and calls for limits on practices that could harm human dignity. The WHO recently called for global governance on human genome editing, emphasizing that germline edits must not be used until ethical, social, and safety standards are established. In AI, the EU AI Act proposes strict regulation on high-risk applications like surveillance, while the OECD AI Principles promote transparency, accountability, and human rights [3].

Even in the corporate world, tech giants like Google and Microsoft have released internal AI ethics guidelines, but enforcement remains weak. Meanwhile, countries like China continue to develop AI and biotech at massive scales with minimal public debate, raising concerns about ethical oversight. The divide between nations with strong regulatory frameworks and those with loose or absent policies poses a challenge to ensuring global ethical standards.

While the world races ahead, it's important to note that Sri Lanka currently does not conduct gene-editing or human cloning research at any significant level. Ethical restrictions, lack of advanced infrastructure, and limited funding in genetic science have kept the nation on the sidelines of these global debates. Similarly, AI development in Sri Lanka is still in early stages, focused mostly on basic automation and data analytics in industries and universities, rather than controversial applications like facial recognition or predictive policing. Although local researchers are exploring AI in healthcare and agriculture, the nation has not yet engaged in the deeper ethical conflicts faced by tech superpowers.

As exciting as the future looks, one thing is clear: ethics must evolve alongside technology. If we are to preserve what makes us human, then our morality must guide our machines, not the other way around. Policies should not only keep up with the pace of innovation, they must define its limits, protect dignity, and ensure that science serves humanity, not the other way around.

Contributing Writer: Ruwani Hewage

Did you know?

In a world brimming with information, some facts still manage to surprise us. From the history of technology to quirky everyday truths, here are some facts that reveal the unexpected wonders of life

The Term "Technology" Dates Back to 330 BC
According to studies, the word "technology" was coined by Aristotle in 330 BC, combining the Greek words "techne" (art or craft) and "logia" (principle).

Apple's iPhone Ads Always Show 9:41 AM
The clock on iPhone screens is always set to 9:41 AM in Apple's promotional materials.This instant in time commemorates Steve Jobs' 2007 unveiling of the original iPhone,

Google Rents Goats for Lawn Maintenance
Goats have been used by Google to mow the grass at its Mountain View headquarters in place of conventional lawnmowers. This environmentally friendly strategy lowers the company's carbon footprint. Pretty much being the GOAT here!

The First Computer Mouse Was Made of Wood
In 1964, Douglas Engelbart invented the first computer mouse, and it was crafted from wood. Sounds pretty mousy for such a groundbreaking invention!

Nokia's First Product Was Toilet Paper
In the 19th century, Nokia began as a paper mill that produced goods like toilet paper before growing into a massive telecommunications company. Later, the business.

The First Smartphone Was Introduced in 1992
IBM unveiled the first smartphone, named "Simon," in 1992. " It was more than ten years ahead of current smartphones, with a touchscreen, the ability to write emails, make calls, and run simple programs.

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The World's Fastest Internet Can Download Netflix in Under a Second
Researchers have developed an internet connection capable of transferring data at 178 terabits per second. At this rate, the full Netflix library can be downloaded in just under a second.devices.

The First Alarm Clock Only Rang at 4 AM
In 1787, the first mechanical alarm clock was created with the intention of only ringing at four in the morning. Alarm clocks couldn't be adjusted to different times until much later. That must have been exhausting.

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