IGNITE

The Future Of
LIVING
SMARTX

Can machines be artists?

Delving into the world of generative AI and its potential to redefine creation.

Urban Growth with IoT

The Role Of IoT In Urban Development Spans From Smart Homes To Smart Cities

Unlocking the Future

Understanding IoT and Its Holographic Frontier

The Cyber Nuclear Threat

How cyberwarfare threatens nuclear stability in the digital age

Editor's Note

Dear Reader,

The Internet of Things (IoT) is no longer a concept of the future—it is a powerful reality shaping how we live, work, and connect with the world around us. From smart homes and wearable devices to large-scale smart cities and industrial systems, IoT is driving innovation, improving efficiency, and creating new possibilities across every sector.

It is with great pride and enthusiasm that we present to you the latest edition of VisionX, the technical magazine published by the IEEE WIE Affinity Group at Sabaragamuwa University of Sri Lanka. This magazine is a platform created to share the latest ideas, innovations, experiments, research findings, and perspectives in the fast-growing world of IoT and emerging technologies.

In this issue, we take you on a journey through topics that are both exciting and thought-provoking. You'll explore how IoT is being used to build smarter cities, how it is expanding into holographic interfaces, and how it connects with advanced technologies like generative AI. We also examine the rising threat of cyberwarfare in the digital age and how it could impact global security and stability.

Our aim with VisionX is to not only inform but also to inspire curiosity, critical thinking, and innovation among readers. Whether you are a student, researcher, or technology enthusiast, we hope this magazine offers valuable insights into the world of connected technology and encourages you to imagine what the future can hold.

Thank you.

Sithija Ruwan Athukorala
Editor-in-Chief

Counseller's Note

Mrs. Subodhi Wasalthilaka
Counsellor
IEEE WIE Affinity Group
Sabaragamuwa University
of Sri Lanka

Dear Students,

It is with great pride and admiration that I extend my warmest congratulations to the IEEE Women in Engineering (WIE) Affinity Group of Sabaragamuwa University of Sri Lanka on the successful launch of VisionX. This publication stands as a remarkable reflection of our commitment to empowering students, nurturing technical excellence, and fostering innovation in a rapidly evolving world.

With the inspiring theme "Shaping the Future of IoT Innovation," this edition focuses on one of the most transformative technological domains of our time; the Internet of Things (IoT). As part of our initiative to engage and uplift young innovators, we proudly organized an IoT-themed article competition, inviting students to explore ideas, share insights, and present practical applications that can influence real-world change. The enthusiasm and creativity displayed by the participants have been truly commendable.

Our goal through this initiative has been to empower IoT enthusiasts by providing a vibrant platform for learning, expression, and innovation. By nurturing these interests at an early stage, we are cultivating a generation of forward-thinking engineers and technologists poised to build a smarter, more interconnected world.

Moreover, as the counsellor of this dynamic Affinity Group, it has been deeply rewarding to witness our members grow fearlessly embracing challenges, uplifting one another, and spearheading meaningful initiatives. The IEEE WIE Affinity Group at SUSL continues to exemplify the strength of unity and shared purpose, inspiring a collective vision where diversity fuels innovation and progress.

I commend the editorial team and all contributors for their hard work in making VisionX a reality. May this magazine continue to grow as a beacon of inspiration, fostering innovation, leadership, and inclusivity for years to come.

Thank you

A New Chapter Begins: Vision X – Empowering IoT Enthusiasts

By Secretary – Vision X | Faculty of Computing, SUSL

It is with immense pride and excitement that we present to you the inaugural edition of Vision X, the official e-magazine of the IEEE WIE Student Branch Affinity Group of Sabaragamuwa University. As the editorial team, our vision was to create a platform that brings out the innovative spirit, critical thinking, and research excellence of our talented students—and what better way to launch this initiative than by hosting an Article Writing Competition centered around one of the most transformative technologies of our time: The Internet of Things (IoT).

We received a range of compelling and insightful submissions from undergraduates who showcased their understanding and creativity in exploring how IoT can shape our world. These submissions reflected not only technical knowledge but also a thoughtful awareness of real-world applications and future trends. The competition provided a space where students could express their ideas freely and push the boundaries of conventional thinking.

After careful evaluation by our panel of esteemed judges, we are thrilled to announce Zulfa Zulfikar, an undergraduate from the Faculty of Computing, as the First Place Winner of the competition.

Her winning article, titled "SMART BUILDING & COMPONENTS CONTROLLING SYSTEM – SMARTX", dives into the futuristic yet rapidly growing concept of smart infrastructure. Her work not only demonstrates technical understanding but also reflects the potential impact such innovations can have on sustainable and efficient living.

We sincerely thank our judges for their time and expertise in selecting the top articles. Congratulations to all the participants who took part in the competition—your passion and commitment have set a high standard for future editions of Vision X. Your voices matter, and we are excited to continue providing opportunities for you to be heard.

We invite you to explore these articles and witness the spark of innovation in every page. May this be the beginning of many more creative and inspiring journeys.

H.P.M.Lakmini Senarathna

Secretary of VisionX
IEEE WIE Student Branch Affinity Group
of Sabaragamuwa University
Faculty of Computing
Sabaragamuwa University of Sri Lanka

IEEE Student Branch of Sabaragamuwa University of Sri Lanka: Innovating for a Better Tomorrow

Composed by Dhushyantha Thilakarathne (ldathilakarathne@std.appsc.sab.ac.lk), Chairperson, IEEE Student Branch of Sabaragamuwa University of Sri Lanka

The IEEE Student Branch of Sabaragamuwa University of Sri Lanka (IEEE SUSL SB), established in 2016 is a leading student-led organization dedicated to technological advancement, innovation, and professional development.

As part of the Institute of Electrical and Electronics Engineers (IEEE)—the world's largest technical professional organization—IEEE SUSL SB actively contributes to bridging the gap between academia, industry, and society.

With strong support from IEEE Sri Lanka Section, the branch continuously organizes various technical, industry-oriented, and community-driven initiatives, providing valuable learning experiences for students.

Key Achievements and Events

Over the years, IEEE SUSL SB has made remarkable contributions, including hosting IEEE Xtreme, Let Me Hack, and Tech Talks, along with organizing the IEEE Sri Lanka Section Student/YP/WIE Congress 2017, which fostered collaboration among young professionals. In 2020, the branch was recognized with the prestigious Best Industry Collaborative Project award, highlighting its efforts in connecting students with industry leaders.

In 2024-2025, the branch has lined up diverse events focused on technology, career development, and community engagement. CodeQuest V1.0 provides students with opportunities to enhance their technical and problem-solving skills through competitive hackathons, while the UI/UX Hackathon encourages innovative design thinking.

Career-oriented initiatives like IndustriX – Industry Awareness Series, CareerForge V2.0, and CV Creation Awareness Session offer students insights into professional growth, mock interview sessions, and industry trends.

Beyond technical training, IEEE SUSL SB remains committed to community engagement and volunteerism. The Social Event for School Students aims to guide younger generations on career pathways, while IEEE Inspire V2.0 and Volunteer Training focus on leadership development and IEEE membership engagement. One of the most unique events, IEEE Vesak Verse 2024, successfully combined Sri Lankan tradition with AI-driven digital creativity. The competition invited students across the country to create AI-generated digital Vesak artwork, receiving overwhelming participation and public engagement through social media voting. The success of Vesak Verse 2024 has set the stage for an even grander Vesak Verse V2.0 in 2025, continuing the tradition of merging culture and technology.

Future Vision and Commitment

The IEEE Student Branch of Sabaragamuwa University of Sri Lanka (IEEE SUSL SB) remains dedicated to technological excellence, professional growth, and community impact, continually fostering innovation, industry collaboration, and leadership development.

As the branch looks toward the future, it remains committed to empowering students through impactful programs, strengthening their technical expertise and professional skills.

In addition to its core initiatives, IEEE SUSL SB is home to the IEEE Women in Engineering (WIE) Student Branch Affinity Group and the IEEE Computer Society (CS) Student Branch Chapter, further reinforcing its commitment to diversity and knowledge-sharing. With a clear mission to advance technology for humanity, the branch invites students, professionals, and technology enthusiasts to join this exciting journey of learning, networking, and innovation.

Empowering Women in STEM: The IEEE WIE Affinity Group at Sabaragamuwa University of Sri Lanka

Composed by Warushika Dahanayake (sdrwarushika@std.appsc.sab.ac.lk), Chairperson, IEEE WIE Affinity Group of Sabaragamuwa University of Sri Lanka

The IEEE Women in Engineering (WIE) Affinity Group at Sabaragamuwa University of Sri Lanka (SUSL) is a vibrant and impactful organization dedicated to promoting women's involvement in STEM (Science, Technology, Engineering, and Mathematics). As part of the global IEEE network, this affinity group strives to cultivate a community that encourages female undergraduates to excel in technology, innovation, and leadership. Through a supportive and inclusive environment, the group empowers young women to pursue careers in technical fields with confidence and ambition.

PearlHack is the biggest annual event – A women's hackathon that fosters creativity and technical skill development, parallel alignment with ICARC (International Conference on Advanced Research in Computing). The 2024 collaboration between PearlHack and ICARC offered participants an extraordinary opportunity to present innovative ideas at an internationally recognized research platform.

Beyond PearlHack, the IEEE WIE Affinity Group organizes a variety of initiatives that empower women while making a broader societal impact. Programs like Pathforward, a knowledge-sharing series, help bridge learning gaps and support personal and professional growth. Qwhiz, an online quiz competition, challenges participants to sharpen their critical thinking and problem-solving skills. A Hope channels the group's passion into charity work, creating positive change in communities. Aurelia, a special event celebrating IEEE WIE Day, inspires young women to explore STEM opportunities and realize their potential in tech-driven careers. The VisionX is an AI and IoT innovation challenge that invites students to address real-world issues using advanced technologies.

The new executive committee for the 2024/25 term, officially appointed on September 10, 2024, is lead the group under the guidance of Counselor Mrs. W.V. S.K. Wasalthilake, the team is headed by Chairperson Ms. Warushika Dahanayake. Supporting her are Vice-Chairperson Ms. Tharani De Silva, Secretary Ms. Shanika Dilrukshi, Vice-Secretary Ms. Imasha Kumarasinghe, Public Relations Manager Ms. Mariyeta Rodrigo, Event Coordinator Ms. Imasha Samarasinghe, Treasurer Ms. Nethmini Sandunika, and Volunteer Coordinator Ms. Anathil Jeyapathy. Together, this dynamic team is set to build on past successes, driving forward the mission to close the gender gap in STEM. Their passion ensures that the IEEE WIE Affinity Group at SUSL remains a beacon of inspiration for women in engineering, both in Sri Lanka and beyond.

Empowering the Future of Computing: Establishment of the IEEE Computer Society Student Branch Chapter at Sabaragamuwa University of Sri Lanka

Composed by Mrs. W.T. Saranga Somaweera (ssomaweera@foc.sab.ac.lk), Counselor, and Mohamed Shabeeb (aimsaeeb@std.appsc.sab.ac.lk), Chairperson, IEEE Computer Society Student Branch Chapter at Sabaragamuwa University of Sri Lanka

The IEEE Computer Society is a globally recognized organization dedicated to the advancement of computer science and technology. For over 75 years, it has been at the forefront of innovation, fostering collaboration among engineers, scientists, academics, and industry professionals worldwide. Through conferences, publications, specialized programs, and various committees, the IEEE Computer Society has played a pivotal role in shaping the future of computing and technology.

Embracing this spirit of innovation and collaboration, the IEEE Computer Society Student Branch Chapter at Sabaragamuwa University of Sri Lanka was officially established in 2022 under the IEEE Student Branch of Sabaragamuwa University, with the support of the IEEE Sri Lanka Section. This chapter was founded to ignite a passion for computer science and related disciplines among students, equipping them with both theoretical knowledge and practical expertise. It aims to provide valuable academic and professional development opportunities while facilitating networking between students and industry leaders.

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The inaugural Executive Committee of the IEEE Computer Society Student Branch Chapter for the 2024/2025 term was officially elected on 10th of September, 2024, during the Annual General Meeting of the IEEE Student Branch at Sabaragamuwa University. This dedicated team comprises key leadership roles, including the

Counselor, Chairperson, Vice-Chairperson, Secretary, Vice-Secretary, Public Visibility Chair, and Treasurer. Their collective vision is to elevate the chapter's role in fostering professional development, knowledge dissemination, and collaborative innovation.

The establishment of the IEEE Computer Society Student Branch Chapter at Sabaragamuwa University marks a significant milestone in advancing computing education, research, and industry collaboration. The executive committee is committed to empowering students through professional development, networking opportunities, and knowledge-sharing initiatives.

The IEEE Computer Society Student Branch Chapter at Sabaragamuwa University serves as a distinguished platform for undergraduates to develop their computing skills, gain industry exposure, and advance in their professional careers. It offers a pathway for students to ascend the ladder of leadership and career development, ensuring they are well-equipped to contribute to the ever-evolving field of computing. Through its commitment to excellence, the chapter continues to inspire and empower the next generation of computing professionals.

Additionally, we encourage students to actively engage in IEEE initiatives, including volunteering opportunities in the IEEE Women in Engineering (WIE) Affinity Group of Sabaragamuwa University and the IEEE Computer Society of Sabaragamuwa University of Sri Lanka. By participating in these global networks, members can further develop their leadership skills, expand their professional connections, and contribute to meaningful advancements in technology and society.

Executive Committee 2024/2025 - IEEE Computer Society Student Branch Chapter of SUSL

THE 5ᵀᴴ INTERNATIONAL CONFERENCE ON ADVANCED RESEARCH IN COMPUTING

The International Conference on Advanced Research in Computing (ICARC) is a renowned annual event that brings together researchers, academics, and industry professionals to explore and share advancements in the field of computing. Each year, ICARC provides a vibrant platform for presenting cutting-edge research, fostering collaboration, and inspiring innovation across a wide range of computing disciplines.

This time, ICARC returns for its 05th edition, scheduled to be held on the 19th and 20th of February 2025, with the theme "Converging Horizons: Uniting Disciplines in Computing Research Through AI Innovation." ICARC 2025 focuses on how Artificial Intelligence is transforming the landscape of computing by bridging multiple disciplines and creating new research frontiers. With the rapid growth of AI, researchers from different fields are joining forces to solve real-world problems, explore new ideas, and create innovative technologies. ICARC provides a platform for scholars, researchers, and industry professionals to share their latest findings, ideas, and experiences. The conference will feature keynote speeches, oral presentations, pre-conference workshops, and tutorials, covering a wide range of topics in computing and AI.

ICARC 2025 also proudly continues its tradition with IEEE Technical Co-sponsorship, and accepted papers will be considered for inclusion in the prestigious IEEE Xplore digital library, subject to quality checks.

In parallel, PearlHack , a special hackathon for female undergraduates across Sri Lanka held to promote innovation and creativity among young women in computing, was organized by the IEEE WIE Affinity Group of SUSL. It aims to inspire them to explore AI and related fields while encouraging teamwork and problem-solving skills. ICARC promises to be a hub for innovation, collaboration, and knowledge sharing, building a better future through the power of AI.

FEATURES

CONTENTS

SMARTX - Smart Building & Components Controlling System

Zulfa Zulfikar (mzfzulfa@std.appsc.sab.ac.lk), Undergraduate, Faculty of Computing, Sabaragamuwa University of Sri Lanka

WHERE FINGER TIPS MEET THE PHYSICAL COMPONENTS.

Our everyday lives have become more reliant on remote controls, which make things like turning on televisions and other electronics easier. The concept of automating building operations and remotely controlling components in organiza- tions has become popular. Imagine being able to control the lights, fans, and electronic systems of an entire building from a single location.

However, the critical consideration remains: are these solutions econo- mically possible? In response to this challenge, we present **SmartX**, aimed at addressing the effec- tiveness of building automation. Our innovative approach eliminates the need for traditional remote controls, providing users with seamless control over electronic gadgets through a user-friendly web application. SmartX signifies a significant adva- ncement in building mana- gement practices, leveraging IoT (Internet of Things) technology.

The Internet of Things (IoT) has significantly evolved and is now used in many fields, such as telemedicine, smart homes, and industrial environments. In order to create an extensive network of smart devices, our proposal makes use of IoT-integrated wireless sensor network technologies. The implementation of a wireless building automation network, consisting of networked sensors and other components, is fundamental to the construction of intelligent buildings.

Through the linkage of building items and equipment with the Internet, SmartX gives authorized users the ability to monitor and operate them remotely. Users may easily turn on and off lights, fans, and switches by using the system's web application interface.

Ms. Zulfa Zulfikar is an undergraduate at the 19/20 Batch, Department of Computing and Information Systems, Faculty of Computing, Sabaragamuwa University of Sri Lanka. Her innovative mind led her to win the Best Article Award of VisionX

Users may also control fan operations by keeping an eye on temperature differences across floors. Additionally, our solution makes it possible to monitor the building's power usage, allowing for effective usage control via the web application interface. A significant advantage of our smart building components' controlling systems is their ability to centralize control, thereby reducing the need for extensive manual intervention. Moreover, our system seamlessly integrates with existing electronic devices within the building, eliminating the necessity for investing in IoT-compatible smart devices.

The benefits of our system encompass enhanced saf -ety, increased comfort, time-saving measures, energy management, and cost reduction. In summary, our project represents an innovative effort to revolutionize building management practices through the adoption of IoT technology. Through this report, we aim to clarify our specifics and our findings and promote the broad adoption of our innovative approach to building management.

Background of *SMARTX*

The idea for SmartX was born out of a recognition that nowadays we're surrounded by technology that's constantly making our lives easier and more convenient. From smartphones to smart TVs, it seems like everything is getting smarter.

First and foremost, we noticed that many fields have been automated with remote controllers, and the convergence of technological advancements and sustainability imperatives has catalyzed the emergence of smart buildings as a cornerstone of modern infrastructure. This led us to envision a centralized solution for a building and have everything adjust to our preferences automatically. The lights turn on as you enter a room and dim when you leave. The temperature adjusts to keep you comfortable throughout the day. And security systems keep an eye on things, giving you peace of mind whether you're at home or away.

Moreover, we were motivated by noticing that organizations and individuals seek more efficient, secure, and sustainable solutions for managing their built environments, the development of a smart building component.

The remote controlling system represents a pivotal opportunity to revolutionize the way we interact with and optimize building operations and overcome the struggle of handling tasks using physical components. We aim to develop a smart building component remote controlling system by creating a centralized system that can monitor and control all the different components of a building remotely. We can unlock a whole new level of convenience, comfort, and efficiency.

We can unlock a whole new level of convenience, comfort, and efficiency.

Our goal is to just make lives easier; smart buildings also have the potential to make a big impact on the world around us. By reducing energy waste and optimizing resource usage, they can help us move towards a more sustainable future. And by improving accessibility and security, they can make buildings safer and more inclusive for everyone.

Additionally, we aim to create a system that works well but one that makes a real difference in people's lives and in the world around us.

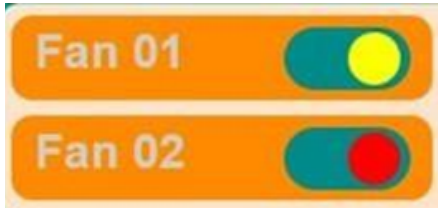Together, we have the power to transform the way we live, work, and interact with our built environment.

What's Literally *SMARTX* is Capable of
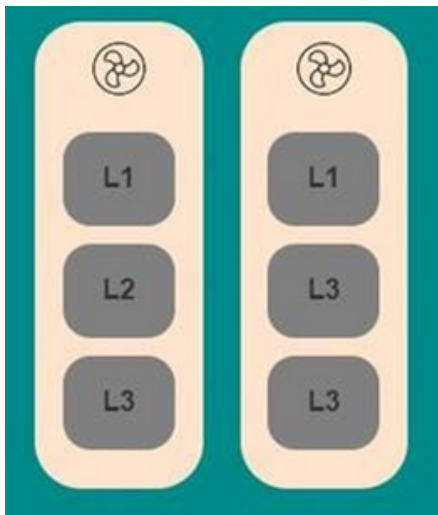
- *Remote Light Controlling*

- *Remote Fan Controlling*

- *Fan Speed Control*

- *Remote Switch Controlling*

- *Temperature Detection*

Specification and Design

SPECIFICATION

- Enable remote monitoring and control of various building components, including lights, fans, switches, and temperature sensors, in real-time.
- Ensure compatibility with existing electronic devices within the building, eliminating the need for investing in new IoT-supported smart devices.
- Prioritize security by implementing encryption protocols and authentication mechanisms to safeguard user data and device control.
- Provide advanced data analytics capabilities to gain insights into energy consumption patterns and promote energy efficiency.
- Enhance user experience through a user-friendly web application interface for seamless management and optimization of building environments.

DESIGN

- *Compatibility with IoT Devices*: Integration with a variety of sensors and IoT devices to collect data on building components such as lights, fans, switches, and temperature sensors.
- *Secure Communication Protocols*: Implementation of secure communication protocols to ensure the confidentiality and integrity of data transmitted between devices and the web application.

- *User-Friendly Interface*: Development of an intuitive and user-friendly web based dashboard for easy monitoring, control, and configuration of building components.
- *Integration with Existing Systems*: Seamless integration with existing electronic devices within the building, ensuring interoperability and compatibility with different models and types of devices.
- Testing and Quality Assurance:Implementation of various testing methodologies to ensure the reliability, performance, and security of the system.

Understanding of Requirements

FUNCTIONAL REQUIREMENTS

- *User Management*: The system should support user registration and authentication, allowing users to log in and log out securely.
- *Real-time Monitoring:* Users should be able to monitor various components of the smart building system in real-time, including temperature, lighting, and security.
- *Emergency Control:* Users with appropriate permissions should be able to initiate emergency controls, such as shutting down systems or activating alarms.

- *Report Generation:* The system should generate reports on system performance, energy usage, and any detected abnormalities for analysis and decision-making.

- *Integration with IoT Devices*: The system should seamlessly integrate with IoT devices such as sensors, actuators, and controllers to collect data and control building components.

- *Compatibility with Existing Systems*: The system should be compatible with existing building management systems and protocols to ensure interoperability and ease of integration.

- *Security:* Access to the system and its data should be securely managed, with appropriate authentication and authorization mechanisms in place.

- *Reliability:* The system should be reliable and available, with minimal downtime and robust error-handling mechanisms.

- *Scalability:* The system should be scalable to accommodate the addition of new devices and users without compromising performance.

- *Performance:* The system should perform efficiently, with low latency in data processing and response times.

- *Ease of Deployment*: The system should be easy to deploy and maintain, with clear documentation and support for system administrators.

- *Interoperability*: The system should adhere to industry standards and protocols to ensure compatibility with other systems and devices.

- *User Experience*: The user interface should be intuitive and responsive, providing a pleasant user experience for all stakeholders involved in building management and control.

Hardware Requirements

- Internet connection device
- ESP 32 devices
- Wires
- 8 way Relay Module
- Current Voltage Multimeter Module (ACS 712)
- Power supplies
- DHT 11 sensor
- Transistors
- Resistors

Software Requirements

- Arduino IDE
- Fire base console
- Visual studiocode IDE
- Web browser
- Circuit drawer
- Integration and APIs
- MQTT Protocol
- Google Console

Technology Requirements

- React
- CSS
- Firebase console
- C++
- Arduino
- Google Cloud
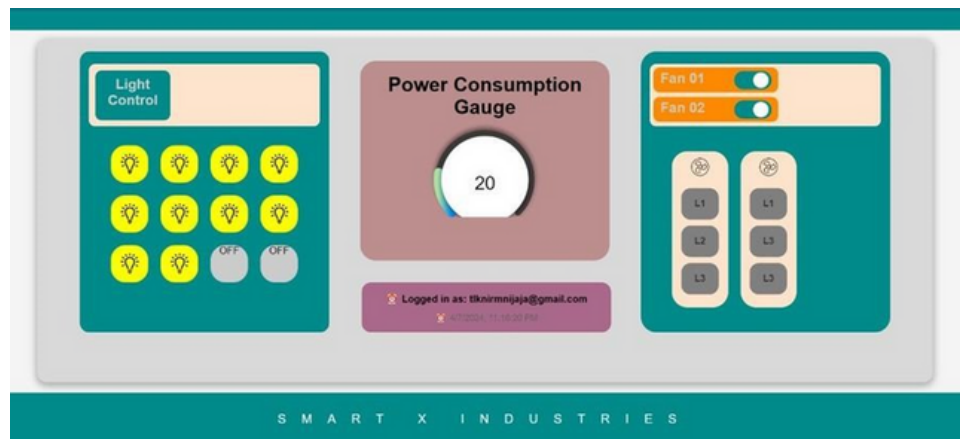
Assumptions while Carrying Out the Project Work

- Assuming that the building where the system will be implemented already has the necessary infrastructure for integrating IoT devices and supporting web application functionalities.
- Assuming that users are comfortable and have a basic knowledge on using web applications.
- Assuming that access to the building components such as lights,fans, and temperature sensors for integration and control purposes will be granted.
- Assuming that sufficient resources, including person- nel, funding, and time will be allocated to the project.

Lacks in the SMARTX

The achieved accuracy of SmartX is a success. There are only a few issues remaining identified as inappropriate, such as the current version of the web application lacks mobile responsiveness, meaning it does not adapt or display properly on mobile devices such as smartphones and tablets. Users may experience difficulty navigating or accessing features when accessing the application from their mobile devices. Also, the website exhi- bits inconsistencies in alignment and display across different web browsers. Users may notice variations in layout, spacing, and overall appearance when accessing the website using different browsers such as Chrome, Firefox, Safari, or Edge.

Future Work

- *Notification Alerts:* Enhance the system to send push notifications or emails to users in case of unauthorized access or fire incidents. By providing timely alerts, users can take immediate action to address security threats or safety concerns.

- *Automated Lighting and Switch Control:* Enhance features that allow users to schedule lighting and switch control based on specific times or events. This will enable users to create customized routines for turning lights and switches on/off, enhancing convenience and energy efficiency.
- *Door and Window Control:* Explore the integration of smart locks and window sensors to remotely control and monitor the status of doors and windows. Additionally, provide features for locking/unlocking doors and opening/closing windows through the mobile app, improving security and convenience.

- *Soil Monitoring and Plant Care:* Implement sensors to monitor the moisture and nutrient levels of the soil for indoor plants. Provide real-time data on soil conditions and send notifications/alerts when watering or fertilizing is required. This will support indoor gardening efforts and promote healthier plant growth.
- *Real-time Data Processing Optimization:* Further optimize algorithms for real-time data processing to enhance responsiveness and performance. Streamline data processing pipelines and leverage parallel processing for timely and accurate control of building components.

- *User Interface Refinement:* Continuously refine the UI of the web application for a seamless user experience. Improve layout designs and navigation flows for clarity and ease of use. Ensure efficient control of building components for users
- *Scalability and Performance Tuning:* Optimize system architecture and infrastructure to handle growing user base and data volume. Ensure high performance and reliability under increased traffic and data processing demands.
- *Enhanced Security Measures:* Strengthen security mechanisms to protect sensitive data and maintain system integrity. Implement robust authentication, data encry- ption, and regular security audits to detect and mitigate vulnerabilities.

Conclusion

In conclusion, **SmartX** represents a groundbreaking advancement in building management, addressing the growing reliance on remote controls and introducing a centralized approach to automation. By leveraging IoT technology, **SmartX** eliminates the reliance on traditional remote controls and introduces a centralized approach to building automation through a user-friendly web application. Through the utilization of IoT-integrated wireless sensor network technologies, **SmartX** establishes a robust

network of smart devices within buildings. A key advantage of **SmartX** is its ability to centralize control and seamlessly integrate with existing electronic devices, eliminating the need for additional investments in IoT compatible smart devices.

This network enables authorized users to remotely monitor and operate building components, improving efficiency and reducing manual intervention. With features like easy toggling of lights, fans, and switches, as well as monitoring of tem-perature variations and power usage, **SmartX** empowers users to manage their buildings effectively.

Looking ahead, future works such as implementing notification alerts, automated lighting and switch control, door and window control, and soil monitoring for plant care will further enhance the capabilities of **SmartX**. These advancements will continue to optimize building management practices and elevate user experience.

In summary, **SmartX** promises to revolutionize building management practices by offering centralized control, enhanced efficiency, safety, comfort, and cost-effectiveness. With its comprehensive approach and ongoing advancements, **SmartX** is committed to leading the way in the smart building revolution, offering tangible benefits for both users and stakeholders.

Dive Into the World of IoT: Exploring Connectivity Beyond Boundaries

S.M.N.D.Senanayake (smndsenanayake@std.appsc.sab.ac.lk), Department of Computing and Information Systems, Faculty of Computing, Sabaragamuwa University of Sri Lanka

The Internet of Things, which is called IoT in brief, is a network of interrelated components that enables communication with each other via the internet or other networks. IoT devices are the physical elements that are connected within an IoT network, and as they have sensors built in, using them for improved services is made easier because human interaction is not necessary for communication. For this reason, IoT has emerged as a significant trend that is being applied in many different industries worldwide.
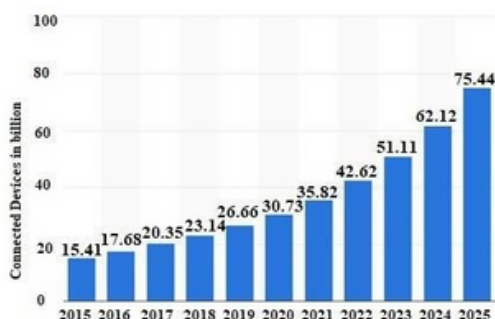
Internet of Things (IoT) connected devices from 2015to 2025(inbillions)

The accompanying graph clearly shows that the number of IoT-connected devices has gradually increased over the last decade. It is estimated that there will be approximately 75.44 million IoT-connected devices worldwide by 2025.

How Does IoT Work?

IoT operates via a combination of devices, sensors, networking technologies, and communication protocols. IoT devices can collect data from their surroundings via sensors. Once IoT devices collect this data, they send it to cloud servers for additional analysis. This is the process of transforming acquired data into information that can be utilized to do computations, find patterns, and make predictions.

The most common technologies that get involved in the analysis of data include Artificial Intelligence(AI), Machine Learning (ML) and Advanced Algorithms.

Ms. S.M. Nishiki Senanayake is an undergraduate at the 19/20 Batch, Department of Computing and Information Systems, Faculty of Computing, Sabaragamuwa University of Sri Lanka.
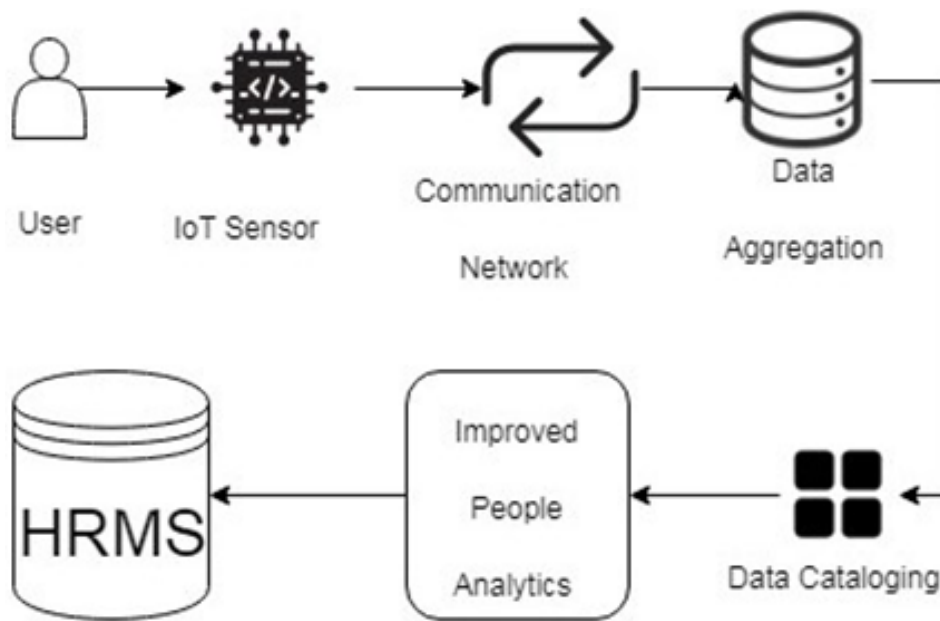
Process of data collection with IoT sensors| Source: Gaur, Bhawna & Shukla, Vinod & Verma, Amit. (201S). Strengthening People Analytics through Wearable IOT Device for Real-Time Data Collection. 555-5c0. 10.110S/ICACTM.201S.877c77c.

The image above depicts the many steps of data collecting and processing with IoT devices. In this picture, the user is the entity from which data is collected. IoT sensors are the devices that collect these data, which are then aggregated, or summarized, over a communication network. Data cataloguing in IoT is the act of organizing, categorizing, annotating, and managing metadata about the data generated, gathered, and used inside an Internet of Things (IoT) ecosystem. After this process ana- lysed and improved data are sent to the Human Resource Management Systems (HRMS).

Examples of IoT Applications

Since the Internet of Things has greatly facilitated communication and enhanced production, it is heavily used in various fields such as agriculture, healthcare, manufacturing, transportation, logistics etc. It is important to study how IoT is used in these fields to make their tasks easier and productive.

IoT is majorly used in agriculture in both inside and outside planting as IoT sensors are more capable of identifying the requirements of any planting environment than traditional tools. IoT devices can also intuit moisture and light intensity very well, which means such data can be optimized to provide a better condition for planting envi- ronments. In addition to these,

livestock monitoring, precision farming, and crop health monitoring are some other applications where IoT is used in agriculture.

The Internet of Things is also employed in healthcare for a variety of applications. Most importantly, IoT devices allow doctors to evaluate patients more effectively and enhance disease diagnoses.

(For example, when diag- nosing a heart attack). IoT devi- ces can keep hospital staff infor- med about the resources avail- able to patients. This enables hospital workers to manage res- ources more effectively. Aside from hospital services,IoT is being utilized to solve a variety of other health-related challenges, including senior care, data analytics, and predictive maintenance.

Manufacturing is another notable application of IoT. Several significant features embedded in IoT sensors/devices, such as real-time data acquisition, wireless connectivity, security features, power management, and remote monitoring, have contributed to their widespread use in the manufacturing sector across a variety of applications, including energy management, supply chain management, worker safety confirmation, and data analysis.

IoT is also widely used in transportation and logistics as well. To improve safety, efficiency, visibility, etc.

IoT is used in these two areas for a variety of objectives, just as it is in other industries. Asset tracking, warehouse management, cold chain monitoring, and fleet management are among the most important applications.

Why is IoT Important?

As we already know, IoT has bec- ome a latest technology that is being used all over the world. It has incredibly surpassed trad- itional internet due to unique features it has. Due to this, companies now tend to adapt with IoT than the traditional internet.

There are several reasons why IoT has become so important and is used in various fields.

IoT devices are automated. This feature leads to increase efficiency in various domains. Automated systems have the ability to perform faster and accurately, therefore these IOT devices increase the accuracy and the speed of tasks.

Another feature of IoT that makes it special is the wireless connectivity. Due to this feature, IoT sensors/devices can be manipulated and maintained very easily. This optimizes resource allocation as well.

IoT is also well-known for its safety features. IoT applications are already being utilized to improve safety and implement security measures in a variety of industries. These sensors can detect dangers quickly and send real-time notifications, which helps to keep employees and others informed about security situations.

Another significant feature of IoT is it can contribute to environmental sustainability. As was mentioned before, it provides technologies, tools and mechanisms that optimizes resource usage by reducing energy consumption unnecessarily. This leads to minimize environmental pollution that has been a huge global issue nowadays.

The Future of IoT

It is predicted that approximately 75% of the electronic devices used all over the world will be IoT connected while the rest (25%) will be non-IoT connected. It shows how tremendous the usage of IoT will become by 2025.

Year	IoT Market Size
2020	$182 billion
2021	$300.3 billion
2022	$544.38 billion
2023	$662.21 billion
2030 (estimated)	$3,352.97 billion

IoT revenue worldwide over the years
Source: (Shewale, 2023)

With new advancements in the IoT technologies, we can assume that this can approach a significant growth during the next decade. The integration of AI and machine learning will make IoT systems more intelligent and capable of autonomous decision-making, resulting in increased efficiency and tailored experiences.
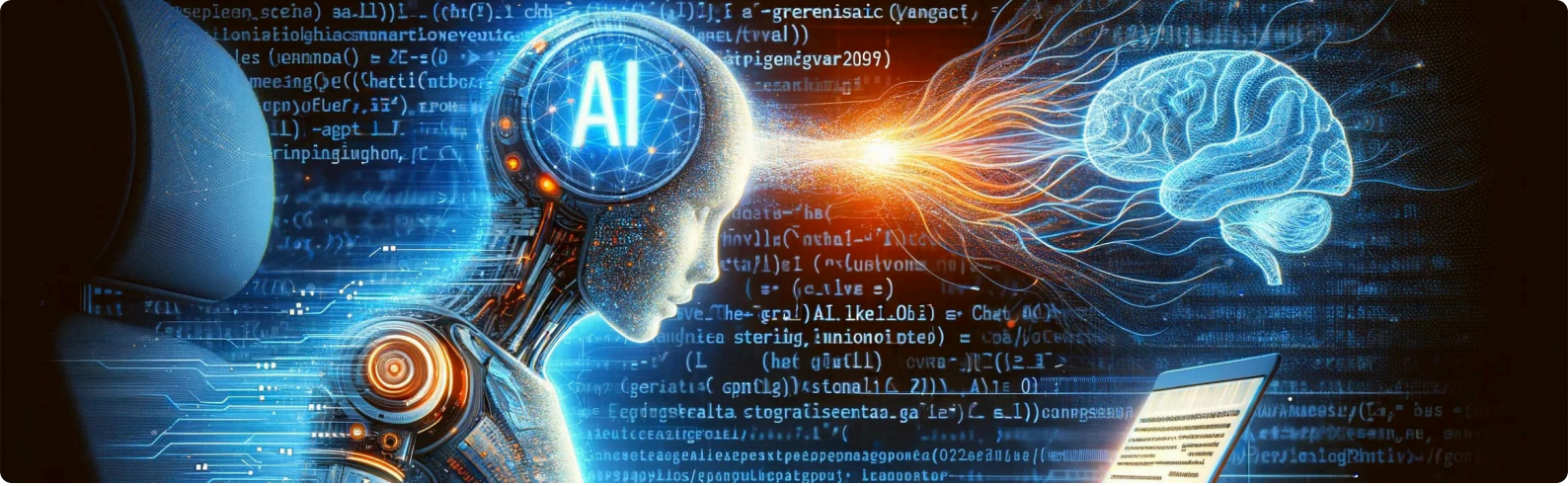

In industries such as healthcare, smart cities, manufacturing, and retail, IoT will continue to drive transformation, ushering in a more connected, data-driven, and technologically advanced era. IoT will even go beyond these boundaries and will provide technologies even for the sectors where IoT is now hardly used.

Can machines be artists? Delving into the world of generative AI and its potential to redefine creation.

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Imagine a machine composing a symphony, or painting a masterpiece. Generative AI, a revolutionary force in artificial intelligence, makes this a reality. By learning from vast amounts of data, machines can now create entirely new and creative content, pushing the boundaries of human imagination. This article will explore the inner workings of generative AI, its impact on various industries, and the ethical considerations surrounding its development. Join us on a journey to uncover the future of creativity, fueled by the power of machines.

Generative AI as an Artistic Force

While traditional AI excels at data analysis, generative AI takes a grou -ndbreaking leap – it becomes an artist. Imagine a tireless apprentice artist studying the techniques of the masters across disciplines. This apprentice, however, isn't human. It's a powerful neural network, fueled by vast datasets. By learning from this data and extrapolating patterns, generative AI conjures entirely new

content, from captivating visuals and evocative text to soul-stirring music and immersive virtual worlds. This ability to create novel outputs lies at the heart of generative AI's transformative potential.

Unveiling Generative AI's Tools

Generative AI's success hinges on a remarkable toolbox. Natural Language Processing (NLP) empowers machines to understand and generate human-like text, acting as a writer's muse that composes poems or crafts narratives. Text-to-Image generation bridges the artistic divide, translating textual descriptions into stunning visuals. Imagine describing a fantastical landscape, and generative AI paints your words into existence.


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Finally, Generative Adversarial Networks (GANs) function like a game of artistic one-upmanship. One neural network (the generator) creates images, while another (the discriminator) tries to identify if they're real. Through this ongoing competition, GANs produce incredibly realistic and detailed outputs. These are just a few of the ingenious tools that fuel the artistic revolution of generative AI.

## Generative AI's Transformative Touch
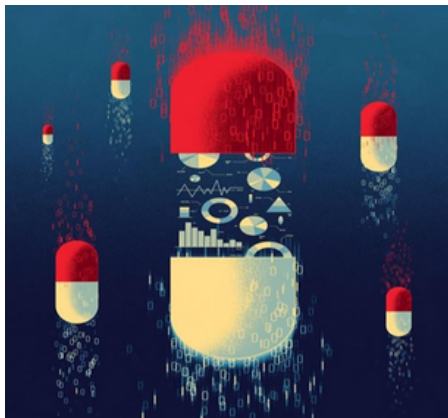
The ripples of generative AI's impact will be far-reaching. Personalized medicine stands to gain immensely, as AI can analyze vast datasets to potentially uncover life-saving treatments. Predictive analytics, powered by generative AI, will revolutionize industries by optimizing processes and minimizing risks. However, this transformative journey isn't without its challenges. The workforce landscape will inevitably shift as humans and machines collaborate. Upskilling and retraining initiatives will be crucial to navigating this new terrain. Furthermore, the rise of AI necessitates new job categories, such as AI ethicists and human-AI interaction specialists, highlighting the dynamic nature of employment in the AI era. Generative AI's potential is undeniable, but ensuring its responsible development and integration into our world will be paramount.

Ethical Considerations in Generative AI

Generative AI's potential is vast, but with great power comes great responsibility. Developers must ensure their creations are ethically sound, prioritizing human well-being and societal values. This necessitates careful consideration of potential biases within training data. Biases can be insidious, and if present in the data, they can be reflected in the AI's outputs.
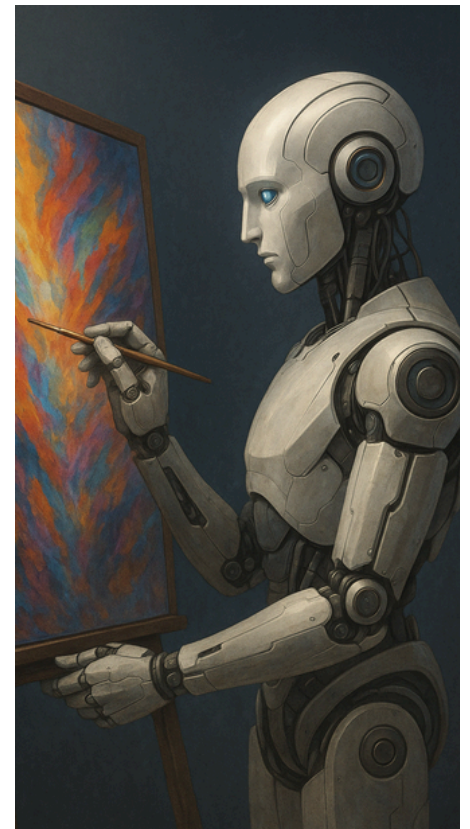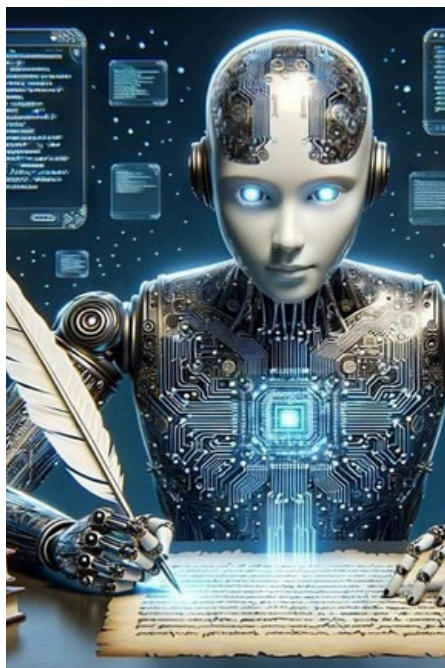
Furthermore, the potential misuse of this technology demands attention. Humility, awareness, and an unwavering commitment to eth- ical principles are essential for those wielding the power of generative AI. Only through resp- onsible development, with acc- ountability and moral rectitude at the forefront, can we harness generative AI's full potential for the betterment of humanity.

Generative AI marks a turning point in AI, pushing the creative envelope for content generation. It holds immense promise for personalized medicine and a future brimming with possibilities. However, responsible development and ethical considerations are crucial.

Revolutionizing Agriculture: IoT's Role in Farming Innovation

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The applications of Internet of Things (IoT) technology have shown to be game-changing in the field of agriculture, where sustainability and efficiency are crucial. IoT offers a variety of opportunities to revolutionize traditional farming practices, from optimizing resource use to continuously monitoring crop health.

The capacity of IoT to offer farmers practical insights gained from data generated by interconnected devices is one of its most important benefits in the agricultural sector. Farmers can collect detailed data on temperature fluctuations, humidity, soil moisture content, and even crop development patterns by deploying sensors throughout their farms. Farmers are therefore able to make well-informed decisions and maximize their agricultural practices thanks to the insightful analysis of this data using complex algorithms.

To ensure that crops receive the exact quantity of water they require while avoiding water waste, IoT-enabled irrigation systems, for example, can automatically modify water flow based on real-time data. Avoiding under or overwatering not only preserves water resources but also increases crop yields.

IoT sensors may also track environmental parameters and identify early indicators of pest infestations or plant illnesses. Farmers who recognize these prob- lems early on can reduce the need for chemical interventions and increase overall production by proactively mitigating risks and preventing extensive crop damage.

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To sum up, IoT has the potential to make the agriculture sector more robust, sustainable, and efficient. Through the utilization of data analytics and networked devices, farmers may maximize output while reducing their ecological footprint. Let's take use of the potential presented by IoT as we set out to create a smarter and more connected agricultural environment and influence farming for future generations.

IoT technology also makes precision agriculture easier, allowing farmers to tailor their methods to the unique requirements of various crop kinds or areas of their farms. Farmers can achieve increased productivity and cost-effectiveness by automating processes like planting and harvesting, implementing targeted pest management measures, and optimizing fertilizer consumption through the use of data-driven insights.

Within agricultural communities, IoT technologies facilitate easy cooperation and information exchange, even outside the boundaries of individual farms. These platforms, which combine and analyze data from various sources, can offer insightful information on a local, regional, or even worldwide level. This helps the agriculture industry create best practices and foster ongoing innovation.

IoT adoption in agriculture is still complicated with difficulties, despite its huge potential. These include the high cost of initial investments, interoperability problems, and privacy concerns over data. It will take coordinated efforts from all parties involved in the agricultural value chain, including technology suppliers, legislators, and farmers, to address these issues.
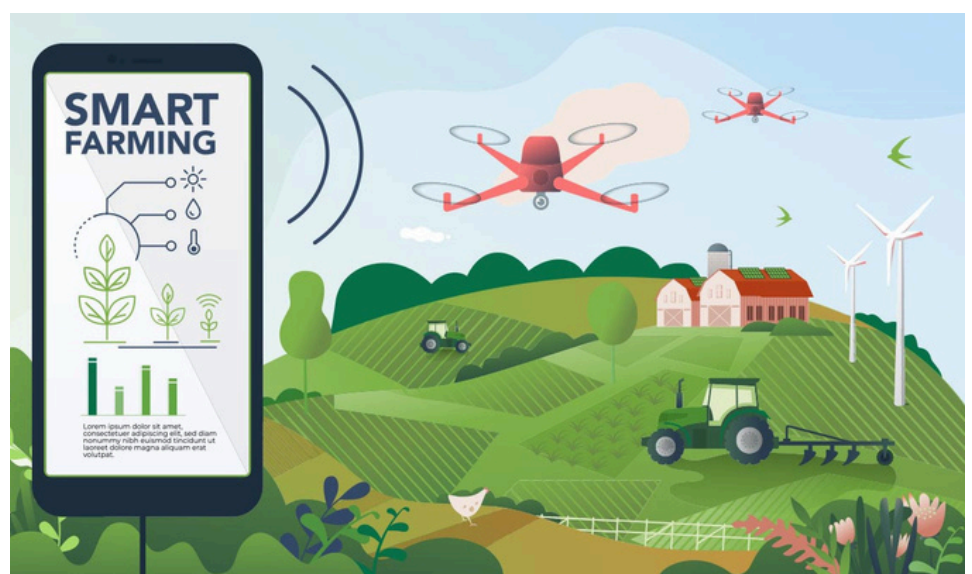
The Role Of IoT In Urban Development Spans From Smart Homes To Smart Cities

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In the contemporary era, cities worldwide are undergoing a remarkable transformation, becoming interconnected, efficient, and sustainable through the pervasive influence of the Internet of Things (IoT). From the convenience of smart homes to the efficiency of smart infrastructure, IoT technology is revolutionizing urban development and reshaping the way we live, work, and interact with our environments.

The Evolution of Urban Living

Living in cities is getting more popular all over the world. There are more people in cities now than ever before. But with all these people comes some problems, like too much traffic, dirty air, and old buildings and roads that don't work well. Luckily, the Internet of Things, or IoT, is here to help. Cities are changing with IoT. It helps fix problems like traffic jams, dirty air, and old buildings and roads. Imagine traffic lights that know when there are lots of cars and change faster to keep traffic moving. Or streetlights that turn off when nobody's around to save energy. That's what IoT can do!

Smart Homes

Smart homes are like the starting point for making cities smarter. These homes have devices that use sensors and connect to the internet. With these devices, homeowners can control things like thermostats and lights that connect to the phone in their homes even when they're not there. so they never have to worry about leaving the lights on or the house too hot or cold. Security cameras let them see what's happening at home in real time. All these gadgets make life easier and save energy.

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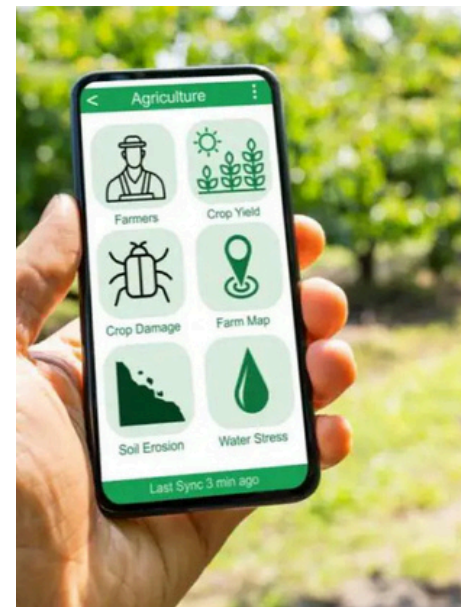
Also, there are smart assistants like Alexa or Google Assistant. These assistants are like the brains of the smart home. They can control lots of different devices, help with daily tasks, and give you personalized help. So, whether you're in a big city or a small town, IoT technology is making everyday life simpler and more comfortable.

Building Smart Infrastructure

As cities grow, they need smarter ways to manage all the people, traffic, and buildings. That's where IoT comes in.

IoT sensors embedded in roads monitor traffic flow, vehicle speeds, and congestion levels. This real-time data allows traffic management systems to adjust traffic signals, control lane usage, and even suggest alternate routes through digital signage or mobile apps. By reducing congestion and improving traffic flow, cities can alleviate delays, lower emissions, and enhance the overall efficiency of transportation networks.

Sensors installed on bridges and other infrastructure assets continuously monitor factors like vibration, temperature, and structural integrity. This data enables engineers to detect signs of wear and potential structural issues early on, allowing for proactive maintenance and preventing costly repairs or accidents. Smart building utilize IoT

sensors to optimize energy usage, improve occupant comfort, and enhance safety. These sensors can monitor factors like occupancy levels, temperature, and air quality, adjusting heating, ventilation, and air conditioning (HVAC) systems accordingly. Additionally, IoT-enabled security systems provide real-time monitoring of building access, fire alarms, and surveillance cameras, ensuring the safety and security of occupants.

Enhancing Public Services

IoT technology is revolutionizing public services, making them more efficient, cost-effective, and citizen-centric.

Sensors installed in waste bins measure the level of waste, allowing waste management companies to optimize collection routes and schedules. By collecting trash only when bins are full, cities reduce unnecessary trips, save fuel, and minimize environmental impact. Furthermore, IoT sensors can detect hazardous materials or illegal

dumping, enabling authorities to respond quickly and appropriately.

IoT-enabled streetlights adjust their brightness based on ambient light levels and pedestrian activity. This not only saves energy but also improves visibility and enhances public safety, particularly in poorly lit areas. Additionally, smart lighting systems can incorporate motion sensors to brighten up areas when movement is detected, further enhancing safety and deterring crime.

IoT enhances public transit by providing real-time information on schedules, routes, and service disruptions. Passengers can access this information through digital signage at bus stops, mobile apps, or even voice-activated assistants.

Additionally, IoT helps optimize routes and schedules, reducing wait times and improving the overall efficiency of public transportation networks. Furthermore, IoT sensors installed on vehicles can monitor occupancy levels, allowing transit agencies to adjust services dynamically to meet demand.

In addition to public infrastructure, IoT is transforming healthcare services in urban areas. Remote patient monitoring devices equipped with IoT sensors allow healthcare providers to monitor patients' vital signs and health status remotely, enabling early intervention and

reducing hospital readmissions. Moreover, predictive analytics powered by IoT data help healthcare organizations anticipate healthcare needs, allocate resources efficiently, and prevent disease outbreaks.

IoT technologies play a crucial role in enhancing emergency services in cities. For instance, IoT-enabled sensors can detect natural disasters such as earthquakes or floods in real time, enabling timely response and evacuation efforts. Furthermore, wearable IoT devices worn by emergency responders provide vital health and location information, ensuring their safety in hazardous situations.

IoT facilitates greater citizen engagement in public services. Through interactive platforms and mobile apps, residents can report issues such as potholes, broken streetlights, or vandalism directly to authorities, fostering a sense of community ownership and collaboration in maintaining urban infrastructure.

Challenges and Considerations

Implementing IoT in urban development has the potential to revolutionize cities, but it also comes with significant challenges.

Security and privacy concerns, interoperability issues, and the digital divide are among the key obstacles that must be addressed
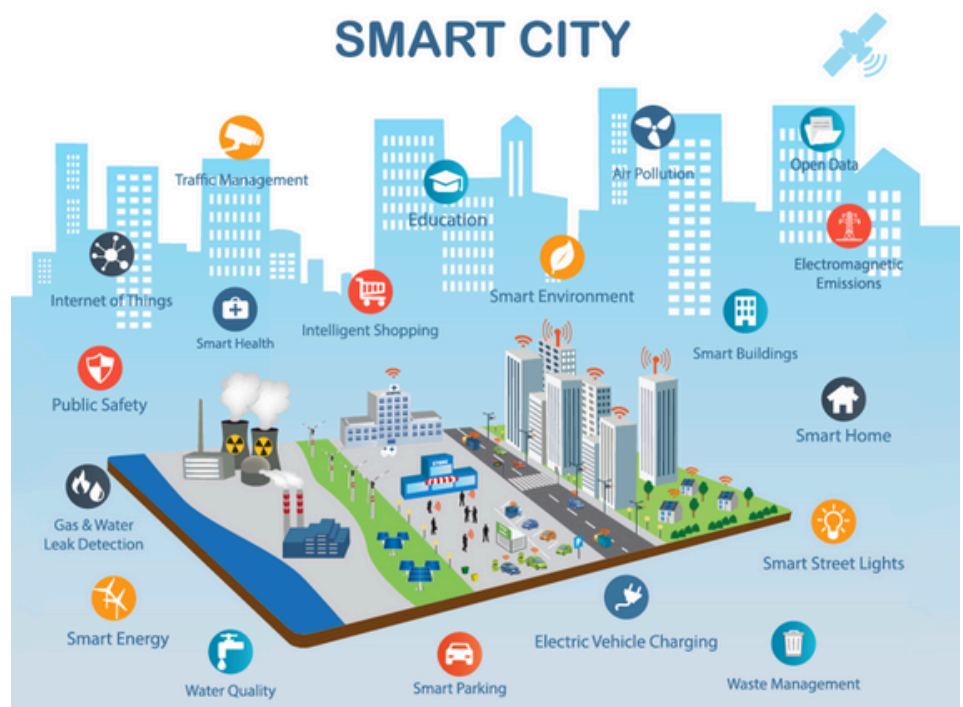
Data protection and privacy are crucial, as IoT devices collect vast amounts of personal data. Ensuring interoperability between devices from different manufacturers is essential for creating seamless systems. Additionally, not everyone has equal access to IoT technology, which creates a digital divide. Promoting digital literacy and providing equitable access to IoT technologies are essential for building inclusive smart cities that benefit all residents.

Furthermore, the environmental impact of IoT, including electronic waste and energy consumption, needs to be carefully managed. Establishing clear rules and regulations to govern the use of IoT data and devices is crucial for maintaining fairness and consistency. By addressing these challenges, we can create smarter, more

incl- usive cities that improve the lives of all residents.

Conclusion

From smart homes to smart cities, the Internet of Things is reshaping urban landscapes, driving innovation, and improving quality of life. By leveraging IoT technology, cities can become more efficient, sustainable, and livable environments for current and future generations. As we continue to explore the possibilities of IoT, it is crucial to prioritize collaboration, innovation, and inclusivity to build smarter, more resilient cities for the future.

What is the Internet of Things

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Term 'Internet of Things' was coined by Kevin Ashton in 1999, to refer to connecting the Internet to the physical world via sensors. Since then, the term has been used to describe any device that interacts with the physical world around it, either by gathering data from sensors, or providing real-world interactions via actuators (devices that do something like turn on a switch or light an LED), generally connected to other devices or the Internet

IoT as a technology area is more than just devices - it includes cloud-based services that can process the sensor data or send requests to actuators connected to IoT devices. It also includes devices that don't have or don't need Internet connectivity, often referred to as edge devices. These are devices that can process and respond to sensor data themselves, usually using AI models trained in the cloud. IoT is a fast-growing technology field. It is estimated that by the end of 2020, 30 billion IoT devices were deployed and connected to the Internet. Looking to the future, it is estimated that by 2025, IoT devices will be gathering almost 80 zettabytes of data, or 80 trillion gigabytes. That's a lot of data!

IoT Devices

The T in IoT stands for Things – devices that interact with the physical world around them either by gathering data from sensors or providing real-world interactions via actuators.

Devices for production or commercial use, such as consumer fitness trackers or industrial machine controllers, are usually custom-made. They use custom circuit boards, maybe even custom pro-cessors, designed to meet the needs of a particular task, whether that's being small enough to fit on a wrist or rugged enough to work in a high-temperature, high-stress or high-vibration factory environment.

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As a developer either learning about IoT or creating a device prototype, you'll need to start with a developer kit. These are general-purpose IoT devices designed for developers to use, often with features that you wouldn't have on a production device, such as a set of external pins to connect sensors or actuators to, hardware to support debugging, or additional resources that would add unnecessary cost when doing a large manufacturing run.

IoT covers a huge range of use cases, across a few broad groups:
- Consumer IoT
- Commercial IoT
- Industrial IoT
- Infrastructure IoT

Consumer IoT

Consumer IoT refers to IoT devices that consumers will buy and use around the home. Some of these devices are incredibly useful, such as smart speakers, smart heating systems and robotic vacuum cleaners. Others are questionable in their usefulness, such as voice-controlled taps that then mean you cannot turn them off as the voice control cannot hear you over the sound of running water. Consumer IoT devices are emp-owering people to achieve more in their surroundings, especially the 1 billion who have a disability.

Commercial IoT

Commercial IoT covers the use of IoT in the workplace. In an office setting, there may be occupancy sensors and motion detectors to manage lighting and heating to only keep the lights and heat off when not needed, reducing cost and carbon emissions. In a factory, IoT devices can monitor for safety hazards such as workers not wearing hard hats or noise that has reached dangerous levels. In retail, IoT devices can measure the temperature of cold storage, alerting the shop owner if a fridge or freezer is outside the required temperature range, or they can monitor items on shelves to direct employees to refill produce that has been sold. The transport industry is relying more and more on IoT to monitor vehicle locations, track on-road mileage for road user charging, track driver hours and break compliance, or notify staff when a vehicle is approaching a depot to prepare for loading or unloading.

Industrial IoT

Industrial IoT, or IIoT, is the use of IoT devices to control and manage machinery on a large scale. This covers a wide range of use cases, from factories to digital agriculture.

Factories use IoT devices in many different ways. Machinery can be monitored with multiple sensors to track things like temperature, vibration and rotation speed. This data can then be monitored to allow the machine to be stopped if it goes outside of certain tolerances - it runs too hot and gets shut down for example. This data can also be gathered and analyzed over time to do predictive maintenance, where AI models will look at the data leading up to a failure, and use that to predict other failures before they happen.

Infrastructure IoT

Infrastructure IoT is monitoring and controlling the local and global infrastructure that people use every day.

Smart Cities are urban areas that use IoT devices to gather data about the city and use that to improve how the city runs. These cities are usually run with collaborations between local governments, academia and local businesses, tracking and managing things varying from transport to parking and pollution. For example, in Copenhagen, Denmark, air pollution is important to the local residents, so it is measured and the data is used to provide information on the cleanest cycling and jogging routes.

Examples of IoT devices you may have around you

You'd be amazed by just how many IoT devices you have around you. I'm writing this from home, and I have the following devices connected to the Internet with smart features such as app control, voice control, or the ability to send data to me via my phone. All these types of devices have sensors and/or actuators and talk to the Internet. I can tell from my phone if my garage door is open and ask my smart speaker to close it for me. I can even set it to a timer so if it's still open at night, it will close automatically. When my doorbell rings, I can see from my phone who is there wherever I am in the world and talk to them via a

tspeaker and microphone built into the doorbell. I can monitor my blood glucose, heart rate, and sleep patterns, looking for patterns in the data to improve my health. I can control my lights via the cloud and sit in the dark when my Internet connection goes down.
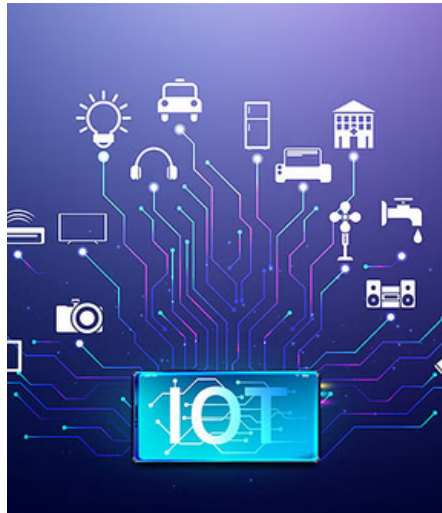
Examples of IoT devices

- Multiple smart speakers
- Fridge, dishwasher, oven and microwave
- Electricity monitor for solar panels
- Smart plugs
- Video doorbell and security cameras
- Smart thermostat with multiple smart room sensors
- Garage door opener
- Home entertainment systems and voice-controlled TVs
- Lights

AURELIA v1.0

Aurelia, organized by IEEE WIE SUSL, is a vibrant celebration of WIE Day that empowers and honors women in engineering. The event features inspiring talks, interactive sessions, and activities aimed at fostering innovation, leadership, and unity among female students and professionals in STEM fields. Through efforts, Aurelia encourages participants to explore career opportunities, enhance skills, and build networks, contributing to the growth of women in technology.

Unlocking the Future : Understanding IoT and Its Holographic Frontier

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The Internet of Things (IoT) is a key force in today's digital landscape, changing how we interact with technology and our environment. IoT is essentially a network of physical objects with sensors and software that allow data to be collected and shared online. These gadgets, which range in size from industrial machinery to home appliances, blend into our daily lives with ease while providing previously unheard-of possibilities and insights.

Smart decisions are made in a variety of industries, including urban planning, healthcare, and agriculture, thanks to the insights gained from IoT data. IoT sensors, for instance, are used in agriculture to monitor crop health and soil conditions. This allows farmers to optimize fertilization and irrigation, increasing yields and resource efficiency. Similar to this, IoT-enabled healthcare equipment allows for remote patient monitoring, which makes pre-emptive interventions and individualized treatment plans possible. The addition of holographic tec-hnology promises to expand the capabilities of IoT as it continues to develop. Imagine a world where traditional screens are replaced with holographic displays projected by Internet of Things devices, providing immersive experiences and real-time data visualization. Holographic Internet of Things (IoT) opens doors to creative applications across industries, from interactive dashboards to augmented reality overlays.

Think about the medical field, where holographic simulations have the potential to transform surgical techniques and medical education by enabling professionals to rehearse intricate surgery in a virtual setting. Holographic displays in retail could

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improve the shopping experience by letting people see items in their homes before deciding what to buy. Holographic IoT has the potential to revolutionize education by providing interactive simulations and virtual field trips.

IoT and holographic technologies together provide fascinating new possibilities, but there are drawbacks as well. To reach its full potential, technological challenge-s, privacy issues, and ethical issues need to be resolved. However, these obstacles can be addressed with creative thinking and the right safetymeasures, opening the door to a more integrated, intelligent, and immersive future.

To sum up, the combination of IoT and holographic technologies redefines communication and engagement inside our ever-digital environment. We are setting out on a journey towards a future where the only limits are our imagination as we embrace this transformative synergy. We can create a more connected society, increase productivity, and improve quality of life by utilizing the power of IoT and holographic technologies.

A HOPE

A HOPE   Photographed by : Malshi Wanigasingha   Organized by : IEEE WIE Affinity Group of SUSL

Hope, organized by IEEE WIE SUSL, is a heartfelt charity initiative aimed at supporting underprivileged students by providing essential school supplies and motivational support. The event was designed to address the educational disparities faced by students in need, ensuring that every child has the necessary tools to succeed academically. Through this initiative, the IEEE WIE SUSL community reaches out to the broader community, spreading kindness and generosity to help brighten the lives of those who might otherwise lack such

resources. The event fosters a spirit of community and compassion among university students, encouraging them to uplift others through meaningful action. It creates an opportunity for young people to come together, collaborate, and contribute to a cause that will make a tangible difference in the lives of underprivileged children. By actively participating in such charitable acts, students are not only helping others but also developing a sense of social responsibility and leadership.Through continuous support, the event aims to break down barriers to education and inspire the next generation of leaders and change-makers. This initiative demonstrates the collective power of compassion and the ability to create lasting change, one step at a time.

The Power of Iot Integration

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today's digitally driven world, the Internet of Things (IoT) has emerged as a transformative force, reshaping the landscape of everyday experiences. At its core, IoT utilizes connectivity to imbue everyday objects with intelligence, ushering in a new era of efficiency and convenience. From smart homes to industrial automation, the reach of IoT is expansive, continually pushing the boundaries of innovation.

One domain where IoT's impact is particularly pronounced is in the realm of road safety. Picture yourself amidst the hustle and bustle of a bustling urban intersection, where the rhythm of daily life is dictated by the ebb and flow of traffic. Here, IoT not only facilitates efficiency but also serves as a guardian of safety, revolutionizing the way we navigate our roads.

At the heart of this transformation lies the integration of IoT-enabled devices with essential safety measures, such as helmet usage for motorcyclists and cyclists. As vehicles approach a traffic signal, embedded sensors detect the presence or absence of helmets, ensuring compliance with safety regulations. However, IoT's influence extends beyond mere enforcement; it empowers communities to foster a culture of accountability and responsibility on the road.

Imagine a scenario where, upon detecting a helmet-less rider, nearby digital screens illuminate with a stark reminder of non-compliance. The individual's face is displayed for all to see, serving as a visual testament to the importance of adhering to safety protocols. This real-time feedback not only deters risky behavior but also fosters a sense of collective responsibility among commuters, reinforcing the notion that road safety is a shared concern.

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Furthermore, IoT's role in enhancing road safety extends to proactive measures aimed at preventing accidents before they occur. Through sophisticated analytics and predictive modeling, IoT systems analyze traffic patterns in real time, identifying potential bottlenecks and hazardous conditions. Armed with this foresight, traffic management authorities can implement targeted interventions to alleviate congestion and reduce the risk of accidents, thereby safeguarding lives and livelihoods.

Beyond the realm of urban commutes, IoT's impact reverberates in the healthcare sector, where it augments patient care delivery through innovative solutions. One such application is the integration of augmented reality (AR) technology within intensive care units (ICUs), where patients often grapple with feelings of isolation and detachment from the outside world.

By leveraging AR-enabled devices, ICU patients gain access to immersive experiences that transcend the confines of their hospital beds. Live feeds and simulations transport them to familiar settings, providing a lifeline of connection to loved ones and the world beyond. This sense of presence and engagement not only alleviates feelings of loneliness but also enhances the overall patient experience, fostering a conductive environment for healing and recovery.

In conclusion, the integration of IoT technology holds immense promise for revolutionizing road safety and healthcare delivery alike. By harnessing the power of connectivity and intelligence, we can create safer, more compassionate communities where the well-being of individuals is prioritized above all else. As we continue to innovate and explore the possibilities of IoT, let us seize the opportunity to build a future where safety, connectivity, and compassion intersect to create a world truly worth living in.

ANNUAL GENERAL MEETING

Annual General Meeting
IEEE Student Branch of SUSL

T*he Annual General Meeting (AGM) organized by the IEEE Student Branch at Sabaragamuwa University of Sri Lanka (SUSL) is a pivotal event that convenes members to reflect on the past year's achievements, elect new leadership, and strategize for future initiatives. This impactful gathering fosters collaboration, encourages innovation, celebrates student excellence, and strengthens the branch's commitment to advancing technology, leadership, creativity, and engineering excellence within the university community.*
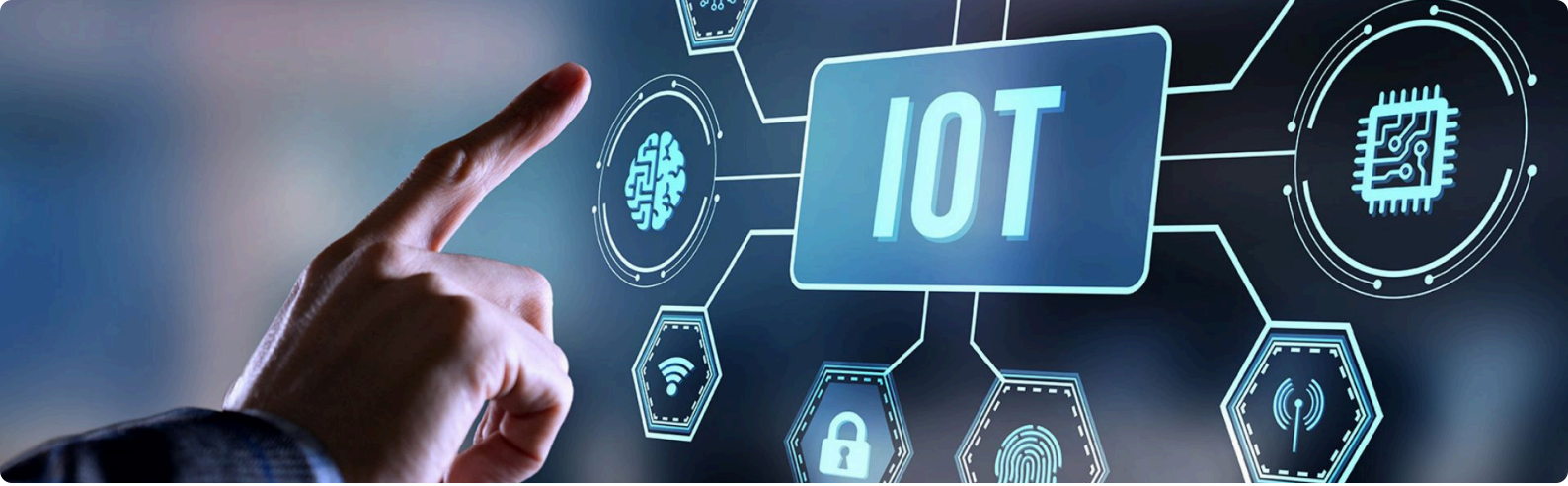
Internet of Things (IoT)

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The Internet of Things is a transformative network of objects equipped with sensors and connected to the Internet, enabling them to collect, share, and act on data. These devices become smart by having special sensors and technology.

For example, you can control your Wi-Fi camera at home, using your smartphone. You can check camera recordings, rotate the camera in another direction, talk through the camera, and control the lights of the camera. We can use these smart devices in different fields like Agriculture, Health, Transportation, etc.

Now think about how a smart refrigerator could function. Users can control the lights, control the temperature, check the goods in it, and add item names not in the refrigerator to the shopping list by using the smartphone.

Why we need IoT?

Using IoT we can bridge the gap between the physical and digital worlds.

- IoT makes our daily tasks more efficient. It saves time with less effort.
- Since IoT devices are used in every field, they have been a great help to empower industries.
- Not only industrial houses, IoT devices have also managed to create new things under people's desires and needs.
- Moreover, they can even identify environmental impacts in advance.

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How does it work?

An IoT device collects data through sensors. Then the IoT device sends that data to an IoT gateway. The IoT gateway acts like a central hub that can send data to IoT devices. In this way, before sending the data to the gateway, the data is sent to an edge device and analyzed locally.

Using IoT can make daily work easier, more efficient, and better managed. Industries use IoT to manage resources better and make things work smoothly. However, a major challenge in using these is the issue of securi-ty and privacy. If hackers attack one of these devices, they can extract our personal data. Whether it's helping us at home, in the fields, or in big industries, IoT is like a friendly helper maki-ng everything work better.

It's not just about gadgets; it's about making our lives and the world around us more efficient and connected.

Working of IoT

Sensors — MOTION, TEMPERATURE, LUX, PRESSURE → Gateway → Cloud/Server → Mobile App
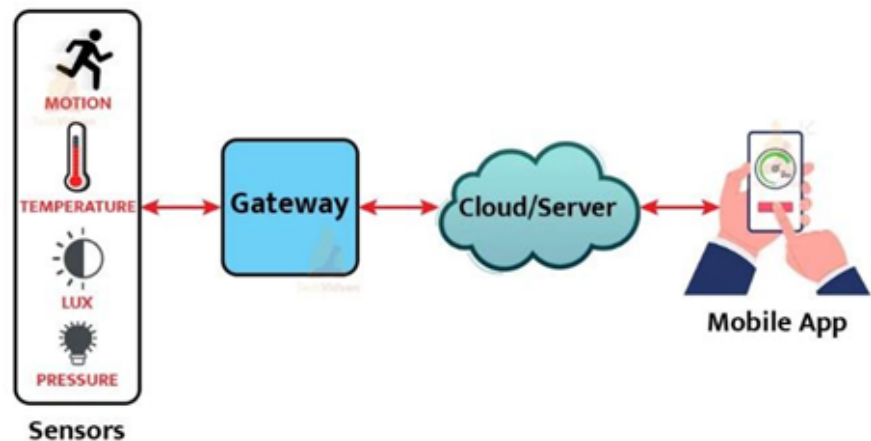
PearHack 3.0

PearlHack v3.0, organized by the IEEE Student Branch of Sabaragamuwa University of Sri Lanka, was successfully held online last month. This national-level hackathon brought together innovative minds from across the country, offering a platform for students to showcase their skills, creativity, and teamwork in developing impactful tech solutions.

Continuing its mission to empower young innovators, PearlHack v3.0 proved to be a hub for future technologists. Participants collaborated virtually, tackled real-world challenges, and presented ideas within a dynamic and supportive environment. The event celebrated technological excellence and inspired a spirit of innovation across institutions.

Mirror of the Future: How IoT Smart Mirrors Are Redefining Home Technology

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How do you currently read this article? It might be on your tablet, PC, or smartphone. There are several advantages to having gadgets connected to the Internet. The Internet of Things, though, is what?

IoT, to put it briefly, is the idea of linking any gadget to the internet and other devices that are linked. To gather and exchange data, every instrument in the network comm-unicates with every other instr-ument. IoT is being used widely nowadays to reduce human load. IoT is used in a variety of applications, including smart grids, smart cities, smart cars, wearables (watches and bracelets), smart farming, smart retail, smart cars, and smart healthcare.

With so many potential uses, the Internet of Things appears to have a brighter future than it did in the past. I'm going to share one of the coolest Internet of Things projects with you in this article.
After learning the definition of the Internet of Things, read on to discover more about the simple yet fascinating "Smart Mirror" project.

Smart Mirror

A smart mirror is a device that performs the role of a mirror but also has the capacity to show the date, time, temperature, and information. To create a smart mirror with Internet of Things (IoT) circuitry that can detect thieves when no one is home and receives news from the internet and displays it.
Everyone deserves a comfortable existence in this world. For his own purposes, modern man has devised a variety of technologies. People in today's environment want to be

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quickly connected and have easy access to information. People need to be aware of and up to date on global events, whether they do so through the internet or television.

The term "Internet of Things" refers to the networking of embedded computing devices that are connected to the internet and may exchange data. With its exponential expansion, the Internet of Things expands its applicability to people's living environments by transforming a house into a smart home. A smart house is one that is networked and has all kinds of digital gadgets connected to the internet so they may talk to one another.

Because of the way our lifestyle has changed, making the most of your time is now crucial. Since everyone looks in the mirror when they go outside, our work is predicated on the notion that the mirror ought to become intelligent. Using premium one-way glass, an LCD monitor, a frame to support the glass and monitor, and a web browser running Python software to power the display are standard components of a smart mirror.

The concept behind this project is to save time by implementing smart home technology. Our lives were changed by the Internet because it made it easier for us to get information and interact with others online. Right now, innovation is focused on giving people more information with

less interaction required to obtain it. The Smart Mirror is the name of the researched and designed item. It's a wall-mounted mirror that shows the user pertinent information about the weather, time, date, temperature, humidity, news, and other topics of interest. The concept of remotely monitoring things via the Internet of Things (IoT) arose. The public considers security to be a critical concern when it comes to our homes.

The homeowner uses this framework to increase the security of their residence. In the unlikely event that a thief breaks into your house while you are away, this framework will send out an alert message to warn you. The PIR sensor will identify movement when a thief enters the house and notify the owner. Without a cord, this project's two facets are home automation and home security. If any kind of human movement is detected close to the mirror, the system's current prototype uses the Internet to send notifications to the owner over messaging.

In 2003, Philips debuted their Mirror TV, which was constructed based on the same ideas as smart

mirrors. Their offering consisted of a standard TV hidden behind a bidirectional mirror, which allowed the TV to double as a mirror and a TV simultaneously. They may have chosen to have the mirror take up more space than the TV. Phillips gave the example of using the device to have the kids clean their teeth and watch cartoons simultaneously.

Later in 2005, Phillips revealed MyHeart, a research project that expanded on the concept of an educational mirror. The MyHeart concept would incorporate a display to show different medical statistics, whereas their initial Mirror TV was just a TV that doubled as a mirror. Onbody electronics were needed for this research in order to gather and process the data, though. The mirror itself was merely an educational exhibit.

In 2011, James Law Cyber lecture created a smart mirror that was sold commercially. This mirror more closely resembles the smart mirrors of today. The product is made up of a 37" two-way mirror covering a 32" LCD display. In addition to TV, internet, and weather forecasts, the display also supports a number of widgets. Several input options are available for the smart mirror, including an onscreen virtual keyboard, a smartphone app, and a remote controller.

Franco Chiarugietal's (2013) paper explores the project's reasoning and motivation. The objective was to measure an individual's well-being by extracting quan-titative elements from official statements of stress, worry, and weariness. Data gathered from multimodal devices would be utilized to derive the features. The information would be gathered using breath samples, photos, videos, and 3D face scans. The primary goal of the project is to digitalize semeiotics the outward manifestations of disease from face image data.

Toshiba unveiled their smart mirror concept at the 2014 International Consumer Electronics Show (CES). As an input mechanism, it made use of gesture control. Toshiba demonstrated their smart mirror in several residential settings. According to their concept, every room's smart mirror would be uniquely tailored for its intended use. Information like a personal fitness tracker and the weather forecast would be displayed on the bathroom smart mirror.

Microsoft published information about their ongoing smart mirror project in 2016. It appears that their goal is not to produce a sm-

art mirror for the consumer market, but rather to provide all the construction instructions and source code on a GitHub repository. Customers can choose to DIY and assemble their own mirror rather than purchasing a finished piece.

A smart mirror designed by Daniel Besserer et al. (2016) allows users to incorporate interactive fitness workouts into their daily routine. Their concept makes use of a Wii balance board for presence detection and a Microsoft Kinect v2 for gesture tracking.

An intelligent mirror that can identify users based on facial recognition, identify emotions, record health metrics, and provide fashion advice was developed by Chidambaram Sethukkarasi et al. (2016). Their work aims to bring the concepts together under the heading of an intelligent mirror rather than delving deeply into any one of its topics.

A business by the name of New Kinpo Group introduced the Hi-Mirror, their version of a smart mirror, in 2017. This smart mirror features a camera to specifically track the condition of your skin. The mirror will measure your skin and provide you with metrics that indicate areas for improvement. The mirror logs a user's skin tone, texture, brightness, clarity, and health on a daily basis using facial recognition technology. At the 2017 CES convention, Griffin

Technologies showcased their version of the smart mirror. Their device, which they are calling the Connected Mirror, will act as the central hub for a number of Griffin Technologies smart home equipment. Notifications from your phone, the local time and weather, and the statuses of other Griffin smart home devices connected to the mirror can all be seen on the mirror. Although the mirror doesn't use user identification, it can have its interface changed with a smartphone app that can also be used to manage other Griffin smart home appliances.

- *Smart Mirror as a Mirror:* When looking and grooming, we may see our view as if it were reflected in a natural mirror thanks to a one-way mirror that has a high concentration of aluminum.
- *Smart Mirror as an Information System:* Using a specified URL, the time, date, weather, and news are retrieved from the internet. The BBC, CNN, and other websites are consulted for news. Details about tempera-

temperature and humidity are obtained using a DHT22 digital sensor. Using jumpers, the DHT22 is attached to the Raspberry Pi board's GPIO pins.

- *Smart Mirror as Security System:* It may be turned into a security system when no one is home by using the VNC viewer to detect human presence. PIR sensors are designed to track a person's movement when they enter a room, record an image of them as they pass by the mirror, and save it in a dropbox.

Additionally, it notifies the owner by updating the photo that was taken and saved in Dropbox; in this way, the smart mirror system can double as a security system.

A cutting-edge smart mirror system that assists in thief detection and displays information such as the time, date, precise humidity and temperature, and the most recent news while grooming and looking in the mirror.

Smart mirrors have a lot of potential to improve how users

interact with and access information. They not only make it easy for users to view pertinent information, but they may also be integrated with other systems to act as theft detection systems. We save time and facilitate information access with our smart mirror. Today's society places a high value on security. We have included a thief detecting feature into our

PearHack 2.0

PearlHack v2.0, organized by SUSL, is a prominent hackathon that brings together innovative minds to solve real-world problems. It provides a platform for participants to collaborate and create impactful solutions. Held successfully last year through a physical event, it continues to inspire and foster a spirit of innovation among students, enhancing their problem-solving and teamwork skills.

The event featured hands-on mentorship, expert-led workshops, and intense coding sessions, encouraging participants to think critically and work efficiently under pressure. With themes focused on social impact, sustainability, and emerging technologies, PearlHack v2.0 not only challenged students technically but also nurtured leadership, creativity, and entrepreneurial thinking within a vibrant tech-driven environment. It offered networking opportunities, exposure to industry standards, and valuable feedback from experienced judges, empowering students to turn their ideas into practical, real-world solutions.

The Cyber Nuclear Threat

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Humanity has always been suffering from a never-ending cycle of conflict, which has led to innumerable wars that have destroyed entire nations and damaged people's collective memories. The human race has proven to have an almost endless desire for violence, as proven by the conflicts between ancient empires to modern proxy wars. An obvious reminder of the dual nature of human invention is provided by the specter of a contemporary conflict driven by AI and cutting-edge technologies. While there is no denying that technology has greatly benefitted society, its potentially devastating effects when applied to hostilities are truly horrifying.

In this contemporary landscape, where the prowess of technological innovation is at its zenith, the consequences of conflict are even more catastrophic. In a world armed with precision-guided missiles, autonomous weapons systems, and the ever-expanding capabilities of AI, the possibility of a modern war evokes a shudder of profound trepidation. The advent of these advancements comes with an alarming question: in a world where the arsenal extends beyond the tangible to the intangible realms of algorithms and autonomous systems, how much more terrifying would the threat of war become?

A dangerous nuclear war has been avoided in large part thanks to the careful balance of power that the United States and the Soviet Union established during the Cold War. The mutually assured destruction (MAD) principle, which holds that no rational actor would launch a nuclear attack because of the extreme threat of retaliation with nuclear weapons, is the foundation of the idea of nuclear deterrence.

However, the rise of cyberwarfare has introduced new challenges to nuclear deterrence. In an age of cyberattacks, it is possible for

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adversaries to infiltrate and manipulate nuclear weapons systems, potentially triggering a nuclear conflict. This raises concerns regarding whether we can still have complete confidence in our ability to control nuclear weapons systems and whether the nuclear deterrence strategy that guided the West and the Soviet Union through the Cold War is still viable.

A successful cyberattack on systems connected to or capable of containing nuclear weapons could have catastrophic effects and possibly start a series of events that would eventually result in nuclear war. An attack of this type has the potential to destroy the reliability of nuclear command and control networks, disrupt early warning systems, disable communication channels, and even alter the nuclear weapons delivery systems themselves. A successful cyberattack on nuclear weapons systems might result in anything from unauthorized nuclear launch orders to the inability of a nation to defend itself against a nuclear attack.

In the era of cyberwarfare, the security of nuclear weapons systems is crucial due to the enormous potential for widespread death and destruction.

The United States Space Force operates a network of advanced radar systems known as Upgraded Early Warning Radars (UEWR) that can detect ballistic missile launches and track objec-ts in space. They are strategically positioned around the world to provide comprehensive coverage and early warning of potential missile attacks.

They are primarily designed to identify and track intercontinental ballistic missiles (ICBMs) and sea-launched ballistic missiles (SLBMs). The UEWRs simultaneously perform general space surveillance and satellite tracking duties.

UEWRs play a crucial role in the U.S. missiledefense system, enablingthe identification and tracking of incoming threats and allowing for timely countermeasures. A successful attack on early warning systems would have catastrophic repercussions.

A tense moment occurred during the Cold War when NORAD computers misreported a Soviet missile attack, which led to a false alarm caused by a software error. Just before the National Security Advisor was ready to suggest issuing a nuclear retaliation order, the error was found.
We were fortunate that the Cold War's false alarms didn't end in a nuclear war. However, we can't depend only on our good fortune to lead us through the perils of the future. It is crucial that our leaders move quickly and decisively to reduce and eventually eliminate the threat that comes with nuclear weapons.

Nuclear weapons systems Cyber threat mitigation requires a multifaceted strategy that includes both national and international actions. Developing strategies that extend the decision-making window while accounting for potential cyber intrusions into early warning systems is essential to reducing the potential of an unintentional launch caused by miscalculation. It is also crucial to create norms that forbid cyber weapon attacks against nuclear weapons systems. Moreover, it is critical to improve nuclear systems' survivability and resilience, as well as Nuclear Command, Control, and Communications (NC3) procedures. Critical systems need to be secured and diversified in order to protect the nuclear deterrent. Plans for modernization should prioritize addressing cyber risks as well. Furthermore, keeping a group of professionals on hand is essential for successfully addressing cyber threats.

In the nuclear age, we stand at a crossroads. Either we can accept responsibility and pave the way for a more secure world, or we can give in to the dangers of complacency and run the risk of a catastrophic future. We get to make the decision. Let us choose wisely; let us choose humanity.

Honoring the Spirit Behind VisionX

On behalf of the Women in Engineering (WIE) Student Branch Affinity Group of Sabaragamuwa University of Sri Lanka, I would like to extend my heartfelt gratitude to everyone who supported the successful completion of VisionX, our IoT-themed project.

As the Vice Chairperson of WIE SUSL, I'm truly proud to see VisionX grow from an idea into a meaningful initiative. Although it was initially planned as a four-stage project, we had to limit it to two stages due to unavoidable circumstances. Despite the changes, both stages were completed successfully, with outstanding contributions from our participants and team.

My sincere thanks to the Faculty of Computing for their continuous support, encouragement, and guidance throughout this project. A special appreciation goes to our Dean of Faculty of Computing, Professor S. Vasanthapriyan.

I am deeply grateful to Mrs. Subodhi Wasalthilake, Student Branch Counselor of the IEEE WIE Affinity Group of SUSL for the for your unwavering support and guidance with such grace and dedication.

 Also I would like to extend my gratitudeto Mrs. Lohara Chathumini,Lecturer and Student Branch Counselor of the IEEE Student Branch of SUSL and Mrs. Saranga Somaweera, Lecturer and Student Branch Counselor of the IEEE CS Chapter Student Branch of SUSL for your continued support and guidance throughout the project and to both academic and non-academic staff, whose support made this initiative possible.

I would also like to extend my heartfelt thanks to the Main Organizing Committee of VisionX for their exceptional hard work, dedication, and commitment. Your tireless efforts, attention to detail, and teamwork were instrumental in bringing this project to life. This achievement would not have been possible without your passion and perseverance, and I am truly grateful for your outstanding contribution.

A special thank you goes to our Editors, Chief Editor Sithija Athukorale, Mohammed Afraar, Lahiru Dayananda, and Madhavi Senarathna whose attention to detail, creativity, and effort ensured the quality and professionalism of this E-Magazine. Your contributions truly brought the publication to life and are deeply appreciated.

And I would like to extend my heartfelt Congratulations to Zulfa Zulfikar, the winner of the first stage for her excellent article on IoT.

As the second stage, we are proud to publish this E-Magazine, showcasing the creative and technical talents of our students. It also features insights about the Faculty of Computing and highlights the work of university societies.

This marks a special moment for WIE SUSL as we launch our very first E-Magazine, and I am honored to be part of it.

Thank you once again to everyone who contributed and supported us throughout this journey.

Tharani De Silva,
Vice Chairperson
IEEE WIE Affinity Group of SUSL