SRM VALLIAMMAI ENGINEERING COLLEGE

COMPUTER SOCIETY OF INDIA

STUDENT BRANCH

MAGAZINE - 2024

VOLUME - V ISSUE – II

LimeLight

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About SRMVEC CSI-SB :

SRM Valliammai Engineering College Student Branch was started in the year 2007. For the past 16 years, SRMVEC has organised various events and contributed many technical articles to CSI. It is one of the most active student branches of CSI. It has received the 'Best Accredited Student Branch Award' for four consecutive years since 2015 at Annual CSI Convention from Computer Society of India. Currently there are more than 370 Student members in the student branch.

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PREFACE

It gives us great pleasure to release the first issue of volume five 'LimeLight'. The SRMVEC CSI-SB members have been enthusiastic to show their talents. This magazine gives desired opportunity and platform to publish the students' thoughts and creativity. We strongly believe that the purpose of knowledge is fulfilled only when it is transferred to another person. In this manner, this magazine would serve as a collection of knowledge. With technology growing leaps and bounds day by day, people need to be aware of the ongoing development in technology. We appreciate every who stood with us in this venture.

Regards
SRMVEC CSI-SB Team

TABLE OF CONTENTS

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EVENTS

LOGIC STORM – Technical Contest

SRM Valliammai Engineering College, in association with Computer Society of India-Student Branch, conducted a Technical Event '**LOGIC STORM'** for the benefit of the students of SRM Valliammai Engineering College. It was organized on 29.07.2024 from 2:10pm to 3.45pm. The event was coordinated by Ms. K. R .Nandhashree, AP/CYS and the Convener of the event was Dr. M. Senthil Kumar, Professor & Head and CSI SB Coordinator was the Coordinator of this event.

PRIZE WINNERS:

1st place - Sakthi. A from SRM Valliammai Engineering College

2nd place - Pavithra.S from SRM Valliammai Engineering College

3rd place - Priyadharshini.S from SRM Valliammai Engineering College

LOGIC STORM consisted of two rounds:

Round 1: Riddle Rush

Participants faced 50 technical MCQ questions related to coding, computers, and technologies, enhancing their problem-solving skills and technical knowledge

Round 2: Solution Safari. A code was displayed, and participants had to write the output for the program on the given sheet, improving their coding proficiency and analytical abilities.

BRAINIAC – Technical Contest

SRM Valliammai Engineering College, in association with Computer Society of India-Student Branch, conducted a Technical Event '**BRAINIAC'** for the benefit of the students of SRM Valliammai Engineering College. It was organized on 13th August, 2024 from 2:10pm to 3.45pm. The event was coordinated by Ms. K.R. Nandhashree, AP/CYS and the Convener of the event was Dr. M. Senthil Kumar, Professor & Head and CSI SB Coordinator.

EVENTS

PRIZE WINNERS:

1st place - Juliet F and Divya Shree BM from SRM Valliammai Engineering College

2nd place - Aswin S and Aruneswar V from SRM Valliammai Engineering College

3rd place - Mousika K and Abinaya Kfrom SRM Valliammai Engineering College

BRAINIAC consisted of two rounds
Round 1: Quiz Bounce
Participants faced technical quiz questions related to coding, computers, and technologies, enhancing their problem-solving skills and technical knowledge.
Round 2: Think Flex
A puzzle was displayed, and participants had to solve it to answer the coding question on the given sheet, enhancing their problem-solving and analytical skills

SRMVEC CSI SB Inauguration

SRM Valliammai Engineering College in association with the Computer Society of India-Student Branch, has successfully conducted the Inauguration of SRMVEC CSI SB for the academic year 2024-2025 on 2nd September 2024. Dr. M. Senthil Kumar, the Chairman of CSI Kancheepuram chapter and coordinator of SRMVEC CSI SB introduced all the office bearers.

Around 70 office bearers including the LimeLight magazine editors were introduced. The event ended with a talk about SRMVEC CSI SB by Ms. K. R. Nandhashree, the event coordinator.

EVENTS

GURUVANDANA – Non - Technical Contest

The SRM Valliammai Engineering College in association with Computer Society of India-Student Branch organized an Event '**GURUVANDANA'** for the Teachers of SRM Valliammai Engineering College to Honor them on the occasion of Teacher's Day. It was organized on 05.09.2024 from 2:10pm to 3.45pm. The event was coordinated by Ms.K.R.Nandhashree, AP/CYS and the Convener of the event was Dr. M. Senthil Kumar, Professor & Head and CSI SB Coordinator is the Coordinator of this event.

PRIZE WINNERS:

1st place - Sattainathan SRM Valliammai Engineering College

2nd place - Banu Chander from SRM Valliammai Engineering College

3rd place - Vinoth kumar Nfrom SRM Valliammai Engineering College

GURUVANDHANA consisted of two rounds:

Round 1: Movie Title Trivia .For Segment 1, participants had to identify movies based on provided lyrics, testing knowledge of soundtracks and music. For Segment 2, they had to recognize films from famous dialogues, familiarity with memorable lines and scenes.

Round 2: Tongue twisters. This was to test the patience of the staff by giving them random tongue twisters.

AI and Cybersecurity

In today's hyper-connected world, cyber threats have grown in both frequency and sophistication. As businesses, governments, and individuals become increasingly reliant on digital technologies, the potential for devastating cyberattacks has never been greater. In this complex landscape, artificial intelligence (AI) has emerged as a powerful tool for detecting and preventing cyber threats. AI-driven systems offer advanced threat detection, rapid response, and enhanced security, making them essential in modern cybersecurity strategies.

How AI Works in Cybersecurity

AI algorithms can analyze vast amounts of data to identify patterns and anomalies that may indicate a cyberattack. This capability enables AI-powered security systems to detect threats that might otherwise go unnoticed. Here are some of the key ways AI is used in cybersecurity:

• Anomaly Detection: AI can learn the normal behavior of a network or system and identify deviations that could signal a malicious activity. This includes detecting unusual traffic patterns, unauthorized access attempts, or abnormal resource usage.

• Threat Intelligence: AI can analyze threat intelligence data, such as indicators of compromise (IOCs) and threat actor profiles, to identify potential threats and proactively protect against them.

• Behavioral Analytics: AI can analyze user behavior to detect signs of compromise, such as unusual login times, suspicious downloads, or unauthorized data access.

• Natural Language Processing (NLP): NLP can be used to analyze text data, such as emails and social media posts, to identify potential phishing attacks or other social engineering attempts.

• Machine Learning: Machine learning algorithms can learn from past attacks and adapt to new threats, making AI-powered security systems more effective over time. AI in Threat Detection: How it Works. Machine Learning in Cybersecurity Machine learning (ML) is one of the most prevalent AI techniques used in cybersecurity. ML algorithms can analyze large datasets, learn patterns, and identify deviations from the norm that may signal a security breach. ML in Action:

• Anomaly Detection: ML algorithms continuously monitor network traffic, looking for unusual activity that could indicate an ongoing cyberattack. For instance, if a user's login activity suddenly spikes from multiple geographic locations, AI can flag it as a potential account takeover.

• Malware Detection: Traditional antivirus software relies on signatures—known patterns of malicious code. However, ML-based malware detection systems can detect new, previously unseen malware variants by learning from known patterns and identifying suspicious code structures. Deep Learning for Advanced Threat Detection Deep learning, a subset of ML, takes cybersecurity a step further by analyzing even

AI and Cybersecurity

more complex data patterns. Deep learning models, such as neural networks, are excellent at recognizing highly sophisticated attacks like zero-day vulnerabilities and APTs. Deep learning models can process enormous volumes of data from various sources, including emails, network logs, and even social media, to identify complex attack patterns. This capability is especially valuable in detecting polymorphic malware, which constantly changes its code to evade detection. AI in Preventing Cyber Threats. Automating Vulnerability Management One of the most critical areas where AI can contribute to cybersecurity is in vulnerability management. AI systems can scan networks and systems for vulnerabilities that cybercriminals might exploit. These systems can then prioritize vulnerabilities based on the level of threat they pose, allowing organizations to patch the most dangerous vulnerabilities first. Automated Patch Management: AI-driven systems can automatically apply security patches and updates, reducing the time it takes to fix vulnerabilities. This is especially important for organizations with large networks, where manually patching each system would be time-consuming and prone to human error. AI-Driven Threat Hunting Traditional threat hunting relies on cybersecurity professionals to sift through mountains of data to detect potential threats. With AI, threat hunting can be significantly enhanced by automating the process of searching for signs of intrusion or malicious activity The Future of AI in Cybersecurity As cyber threats become more complex and AI technologies continue to evolve, the future of cybersecurity will increasingly depend on AI. Here are some emerging trends in AI-driven cybersecurity: a. AI and Blockchain Integration The combination of AI and blockchain technology is poised to revolutionize cybersecurity. Blockchain's decentralized nature ensures the integrity of data, while AI can monitor blockchain transactions for any signs of fraud or malicious behavior.

Conclusion:

Artificial intelligence is revolutionizing the field of cybersecurity, offering new ways to detect and prevent cyber threats. With its ability to analyze vast amounts of data, detect anomalies, and automate routine tasks, AI enhances the speed, accuracy, and efficiency of cybersecurity efforts. However, challenges such as data quality, adversarial AI, and overreliance on automation must be addressed to fully realize AI's potential in safeguarding digital environment

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BLUE EYE TECHNOLOGY

INTRODUCTION:

These days, technology has advanced to the point where we sit in front of computers that can detect and regulate human emotion—a concept known as " BLUE EYE TECHNOLOGY. "

With this technology, devices like voice and facial recognition software are utilised to detect the bodily emotions of a person. Blue Eye Technology uses technology that can sense our emotions with a mouse, confirm our identification, feel our gifts, and start a conversation with us. This study discusses the most recent methods, known as the Emotion Sensory World of Blue Eye Technology, which use image processing techniques to discern human emotions such as sadness, happiness, and surprise. Imagine living in a society where people communicate with computers. The Blue in question is the Blue Eyes technology.

Fig 2.1:-Blue Eye Technology

TECHNIQUES OF BLUE EYE:
EMOTIONAL MOUSE:

It acquires physiological information and passionate state, for example, heartbeat, pressure, temperature and so forth through the pinch of the client on mouse where various sensors, (for example, pressure sensor, heartbeat sensor, GSR sensor, temperature sensor) are sent inside it. At that point, it decides the character of the client.

MANUAL AND GAZE INPUT CASCADING: A webcam is utilized to rapidly decide the gleams, understudies of the client under factor and practical lightning conditions and wrap the cursor to each new object the client looks at. At that point, the client assumes responsibility for the objective by hand close to the objective or overlooks it and quest for the next one.

ARTIFICIAL INTELLIGENT SPPECH RECOGNITION:

The client addresses the PC through mouthpiece and that discourse get shifted and put away in RAM. The info words are examined and coordinated against the inside put away words. Example, coordinating is intended to search for the best fit in view of varieties in tumult, pitch, recurrence distinction, time hole, and so on. The recognizable proof makes some move be made. THE SOFTWARE: Looking after working operators' physiology. The condition is that the most

BLUE EYE TECHNOLOGY

task of Blue Eye System Software. Real-time buffering of the incoming data, physiological data analysis and alarm triggering is being performed by the software to show the instance reaction on Operator condition. Several functional modules System core consists of The Blue Eyes software which facilitates the flow of transfer between other system modules (eg. transfers data from the Connection Manager to data analyser's, processed data from the data analyser's to GUI controls, other data analyser's, and data.

The Visualization module provides an interface for the supervisors. A preview of selected video source and related sound stream the working operator's physiological condition's watching is enabled by this software. Whenever the supervisor instantly signalls the incoming of alarm messages. the Visualization module is often set in an off-line mode, where all the data is fetched from the database. The supervisor reconstructs the course of the chosen information. Adding extraordinary perceptual abilities to computers would enable computers to work together with citizenry as intimate partners. Operator's duty by watching all the recorded physiological parameters, alarms, video and audio data. A set of custom-built GUI controls is used to present physiological data.

THE HARDWARE:

DATA ACCESSING UNIT:

The Data Acquisition Unit may be a mobile part of the Blue eyes system. Its main task is to fetch the physiological information from the sensing element and to send it to the central system to be processed. To accomplish the task the device should manage wireless Bluetooth connections (connection establishment, authentication and termination). Personal ID cards and PIN codes give operator's authorization. Communication with the operator is carried on employing a simple 5-key keyboard, a little LCD display and a beeper.

CENTRAL SYSTEM UNIT HARDWARE:

It is the second peer of the wireless connection. The box contains a Bluetooth module (based on ROK101008) and a PCM codec for voice data transmission. The module is interfaced to a PC employing a parallel, serial and USB cable. To program operator's personal ID cards we developed a simple programming device. The computer programmer is interfaced to a computer victimization serial and Inside the system Atmel 89C2051 microcontroller.

BLUE EYE TECHNOLOGY

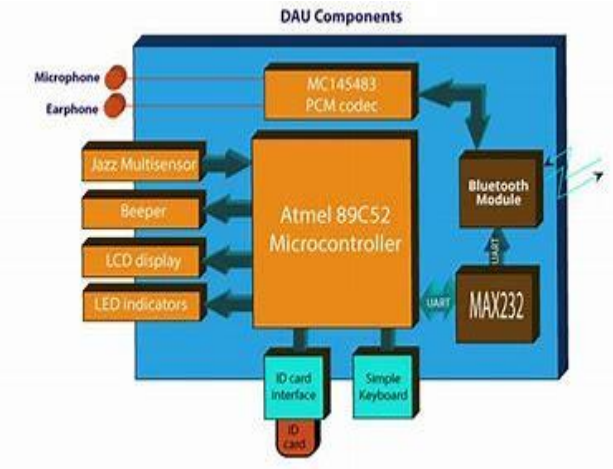

Fig 2.2:-Hardware System

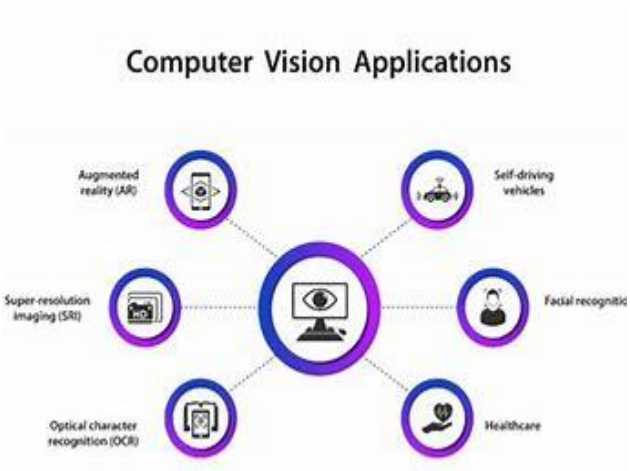

Fig 2.3:-Real time Application

Researchers are hopeful that by scaling up the production of brain organoids and training them with artificial intelligence, the system could revolutionize various fields. Brain-computer interface or BCI technology, helped a paraplegic man Gert Jan Oskam who had been in a motorbike accident, to walk again using brain implants and AI.

However, a concern regarding organoid intelligence is the potential for creating enhanced intelligence. As these mini brains are designed to mimic the structure and function of the human brain. There is a possibility that they could develop superior intelligence surpassing human intelligence in some areas.

CONCLUSION: Today's world is growing up with new technologies. The blue eye technology is very useful in many aspects of technology. It ensures a convenient way of simplifying life by providing more delicate and user-friendly facilities on computing devices. Anyway, this is only a technology forecast. In future, to develop the hardware, it maybe possible to create a computer which can interact with each other with the use of Blue Eye technology.

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QUANTUM COMPUTING

Introduction:

The term "quantum computing" describes a type of computational technology that processes, stores, and manipulates vast amounts of data and executes intricate calculations that are beyond the capabilities of conventional computing systems and supercomputers. It does this by utilizing the concepts of quantum mechanics, such as entanglement, superposition, and interference. Common computers of today are powered by chips that compute with bits. Working of Quantum Computing: Binary systems are used by modern computers to encode data. Such a binary framework operates on processors that compute using transistors. In the circuitry of the computer, transistors function as switches, producing 0s and 1s to process computing logic. These 0s and 1s are swapped out for quantum bits, or qubits, in quantum computers.

1. Qubits: Qubits are used in quantum computing. These are examples of quantum-mechanical systems that scale exponentially beyond ordinary ones and zeros and can take on a variety of quantum values. A two-qubit system, for instance, is capable of four simultaneous computations; a three-qubit system, eight; and a four-qubit system, sixteen.

2. Adposition: The ability of a quantum system to exist in multiple states simultaneously is implied by superposition. Take a coin toss scenario, for instance. The coin comes up heads or tails when you flip it. When the coin is hung in midair, on the other hand, it simultaneously holds both heads and tails.

3. Intertwinement : The process of creating a correlation between two or more qubits to entangle them is called entanglement. Any modification to one qubit that is entangled always affects the other qubits without exception.

4. Interference: By increasing or decreasing the wave functions of quantum particles, interference is a technique for managing the quantum states of a quantum system. On the other hand, a quantum computer follows these procedures to maximize seat distribution: 1. Takes qubits into account and generates quantum superposition for every conceivable quantum state. 2. The encoder sets up the qubits and applies phases to every quantum state. The amplitudes add for all potential in-phase sitting ways and cancel for all possible out-of-phase sitting ways.

Fig 3.1:-Quantum Computing

QUANTUM COMPUTING

Importance of Quantum Computing: Over the next ten years, quantum computing is expected to completely transform a number of business verticals, including artificial intelligence, machine learning, finance, medicine, and encryption. The money that governments, businesses, and investors are throwing around in an attempt to achieve ultimate quantum dominance is what drives most of the advancements in quantum computing. The goal of the "National Quantum Initiative," which was started by the US government in 2019, is to expand the field of quantum computing. China, too, is advancing its aspirations towards quantum computing by dedicating $10 billion toward the construction of the "National Laboratory for Quantum Information Sciences." Let's examine the justifications on why quantum computing

1. The quest to solve rising complex problems: The issues that modern humans face are far more complex than what modern technology can solve. Because of their extreme complexity, many issues would take millennia for modern supercomputers to resolve. Examples include issues with stock profile management, optimization, contemporary cybersecurity, aerospace, molecular science, and other fields.

2. The commercial potential of quantum computing: It is common knowledge that fertilizers containing ammonia account for around half of the world's food production. The "Haber-Bosch process," a chemical reaction that calls for high pressure and temperature, is how this ammonia is made. One of the main issues is that the process's physical limitations need a significant amount of energy, which makes them challenging to address. Quantum computers are useful in this situation.

3. Supports non-linear problems: When solving linear problems with a primary focus on sequential processes, classical computing is most appropriate. Linear mathematics, the study of linear equations and transformation properties, is the basis upon which such computing systems are constructed. But nature is, at its core, somewhat ambiguous and non-linear. Classical systems do not handle such nonlinear situations well. Nonlinear data can, nevertheless, be processed by quantum computers.

4. Handling huge rise in the amount of data: In the big data and digital Age we live in today, an incredible amount of data is created every day. With the advent of the Internet of Everything, every wearable, gadget, sensor, and IoT device is linked to a computing network and adds to the data that is produced. Domo estimates that every day, computer devices produce about 2.5 quintillion bytes of data. Quantum Computer vs. Classical Computer Compared to classical computers, quantum computers are built on a simpler architecture. They lack a processor and

QUANTUM COMPUTING

memory. A set of superconducting qubits is all that's needed for a quantum computer.

5. The way that conventional and quantum computers handle information differs. Qubits are used by quantum computers to execute multidimensional quantum algorithms. When qubits are added, their processing capability grows exponentially. Bits are used by a classical processor to run different programs much less processing power is available in classical computers.

Uses and Benefits of Quantum Computing: Security, finance, intelligence and military affairs, drug development, aeronautical engineering, utilities (nuclear fusion), polymer design, machine learning, artificial intelligence (AI), Big Data search, and digital manufacturing are just a few of the areas where quantum computing may have a significant impact. Information exchange could be made more secure with the usage of quantum computers. or to enhance radars' capacity to identify aircraft and missiles. Quantum computing may enable financial institutions to create investment portfolios for institutional and retail clients that are more successful and efficient.

Future of Quantum Computing:

1. Better Hardware: One of the primary obstacles in quantum computing is the development of hardware capable of performing quantum computations with reliability.

2. Chemistry and Materials Science Applications: Quantum computing has the potential to significantly speed up the search for novel materials and medications by modeling intricate chemical reactions and interactions that are challenging or impossible to simulate with traditional computers. 3. Developments in Cryptology: Many of the current encryption techniques used to protect sensitive data could be broken by quantum computing. That being said, scientists are also working on creating brand-new encryption techniques that are protected against quantum computer attacks. 4. Machine Learning & Optimization Optimization issues in supply chain management and logistics that are unsolvable for traditional computers may be resolved by quantum computing.

Fig 3.1:-Uses of Digital Twin

QUANTUM COMPUTING

Quantum Computing Companies of the Future:

We will now take a look at some of those newer startups and companies in the space, founded within the last year or two, that are innovative in their approaches and have a good chance to unlock some of the possibilities of quantum technology.

1. Abelian

In order to guarantee the long-term security and anonymity of its customers' digital gold, ABEL, Abelian uses post-quantum cryptography methods. By employing lattice-based linkable ring signature methods, Abelian secures the amount in transactions secret and guarantees that wallet addresses remain untraceable.

2. Planqc

Planqc, the first startup in the field of neutral atom quantum computing, was founded in 2022 by Alexander Glätzle, SebastianBlatt, Johannes Zeiher, Lukas Reichsöllner, Ann-Kristin.

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Green IoT

Introduction to Green IoT:

Two essential components are combined in the Internet of Things (IoT):

"Internet" and "Things." It describes anything that have the ability to connect to the Internet, including smart devices, sensors, and other items that can be accessed and used at any time and from any location. Kevin Ashton originally used the term "Internet of Things" in 1999 to refer to a development beyond machine-to-machine (M2M)

IoT, according to Ashton, is an intelligent network of linked devices with the ability to sense, control, and program their surroundings. Embedded technologies are used by IoT-enabled devices to connect and communicate, either directly or indirectly, with the Internet and other devices.

Terms related to Green IoT (G-IoT): IoT has been a game-changing technology in the last ten years, improving people's quality of life by developing platforms with sophisticated sensor networks,

Green IoT

connected devices that can share data across networks to conduct jobs more accurately, and modern communication .

In particular, green IoT tries to lower CO2 emissions while simultaneously promoting a smarter, more sustainable world by lowering energy use in IoT systems. The definition of "green IoT" is "the process of developing, utilizing, producing, and getting rid of servers, PCs, and associated subsystems—like displays, storage devices, printers, and communication network systems—in an effective and ecologically conscious way."

Green IoT Technology Enablement: Green technologies aim to enhance the energy efficiency of communication and computing technologies, resulting in lower energy consumption and more effective use of green infrastructure.
Green IoT (Internet of Things) Principles and Roles:
Several concepts can be implemented to make IoT more environmentally friendly, based on an assessment of various technologies, approaches, and techniques for implementing Green IoT:
• Using bioproducts in producing G-IoT components and emphasizing environmentally friendly designs.
• Making use of renewable energy sources, including geothermal, solar, wind, and water- incorporating privacy and security features into each G-IoT system communication.

• Developing effective guidelines to lower energy usage in smart buildings, where energy use can be greatly impacted by policies.
• Improving the architecture of networks

G-IoT and Sustainable Environment:

By utilizing sustainable technological advancement, Green IoT seeks to enhance both human well-being and the environment by making the world more intelligent and productive. Enhancing environmental and economic sustainability is made possible by Green IoT, which is made possible by technological developments in IoT-enabling fields.
The Goal of G-IoT is Sustainable Development: To ensure prosperity for present and future generations, sustainable development seeks to balance the social, economic, and environmental needs of society. Green IoT uses cutting-edge technical solutions to promote a smarter, more sustainable world, with the goal of improving human and environmental well-being.
Application Areas for Green IoT: Encouraging intelligent decision-making, delivering the best solutions, and providing intelligent services to enhance life quality are the main objectives behind the development of IoT applications.

Green IoT

Major areas of Green IOT application consist of:

1. Smart Homes
2. Industrial Automation
3. Smart Healthcare
4. Smart Cities
5. Smart Environments

Fig:4.1 Applications of Green IOT

Green Machine-to-Machine (M2M), Green RFID, Green Wireless Sensor Networks (WSN), Green Cloud Computing (CC), and Green Data Centers (DC) are examples of communication technologies that are included in the Green IoT In conclusion, sustainability is a crucial component of the Internet of Things. To ensure sustainable resource use and environmental preservation, it is important to keep an eye on the technologies' quick development. Reducing energy consumption, conserving resources, and cutting carbon dioxide emissions are the biggest contributions made by G-IoT technology. These actions directly address climate change and lessen global pollution

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SYNTHETIC LIFEFORMS: ROBOTICS MEETS BIOLOGICAL DESIGN

PREFACE:

The science of synthetic biology and robotics is fast developing and has the potential to revolutionize many scientific and technological fields. Recent years have seen notable breakthroughs in the multidisciplinary subject of synthetic biology, which integrates biology, nanotechnology, and engineering. Simultaneously, the bioelectronics sector is experiencing notable growth, capitalizing on the potent amalgamation of biological constituents with electronic systems to provide inventive resolutions. These two disciplines are poised to create new opportunities and spur innovations in a range of domains, including industrial production, environmental monitoring, healthcare, and more, as they continue to intersect.

There are many different terminologies and definitions for synthetic biology, which present issues for this dynamic and expanding field. These are a few typical definitions:

- Advanced genetic engineering
- Constructing genetic engineering
- Creating minimum cells from the ground up
- Reengineering biological systems
- Creating new artificial functionalities in cells
- Learning by building

From copying and pasting DNA, humans have progressed to programming the A, T, G, and C sequences that make up biological software.

Indeed, the combination of synthetic biology and robotics is a revolutionary advancement with the potential to revolutionize a number of industries, including healthcare, environmental monitoring, and industrial production. This multidisciplinary method combines the operational efficiency and precision of robotic systems with the creative potential of synthetic biology, which is concerned with creating novel biological components and systems.

BIOLOGICAL MANIPULATION USING ROBOTICS:

By combining robotics and synthetic biology, two cutting-edge sciences have come together for the first time, greatly improving the efficiency and precision of designing, building, and optimizing new biological systems. This synergy accelerates the development of synthetic biology applications by using the characteristics of robotics, namely automation, precision, and scalability.

Microfluidics, which enables the exact manipulation of minute amounts of biological fluids and cells, is essential to this integration. Researchers are able to program cellular behavior with remarkable accuracy through the development of complex biological pathways and circuits made

SYNTHETIC LIFEFORMS: ROBOTICS MEETS BIOLOGICAL DESIGN

possible by the robotic manufacture of microfluidic devices. Scientists can create artificial gene networks, optimize metabolic pathways, and create novel biosensors by fusing synthetic biology with microfluidics

Robotics has enabled closed-loop control systems, which are a major breakthrough in synthetic biology. With the help of these technologies, biological reactions may be monitored in real time, enabling modifications to maintain peak performance. The development of resilient biological systems that can adjust to shifting circumstances is encouraged by this feedback loop. Additionally, labor-intensive processes like cell culture, gene editing, and DNA assembly are automated by robotics. Advanced liquid handling and microscopy capabilities on robotic workstations improve high-throughput testing and hasten the discovery of new biological pathways and circuit. The production of biofuel, bioremediation, and agriculture are just a few of the biotechnology applications that could benefit greatly from this convergence. Through the application of robotic technology, scientists may build and optimize biological systems to produce sustainable energy, clean up the environment, and produce food. This allows researchers to develop innovative biobased solutions.

NEWS IN SYNTHETIC BIOLOGY:
Synthetic biology is a broad field of inventions that use engineering concepts to create new biological components, tools, and systems. The following are some significant advances in synthetic biology:

Technologies for Gene Editing: CRISPR-Cas9:

With the revolutionary gene editing technology CRISPR-Cas9, scientists can modify DNA with previously unheard-of efficiency and precision. The two primary parts of this bacterial defense system are the Cas9 enzyme and CRISPR RNA (crRNA). The Cas9 enzyme is directed by the crRNA to the target DNA sequence, where it cleaves the strands of DNA to produce a double strand break. This initiates the cell's inherent repair processes, enabling scientists to make modifications to the DNA. Gene editing, knockout, knockin, and other alternatives are available with CRISPR-Cas9, which has uses in basic research, agricultural improvement, gene therapy, and cancer research. Its benefits, which include accuracy, effectiveness, and adaptability, make it a potent instrument for improving biotechnology and genetics. Nevertheless, obstacles and restrictions including mosaicism, off-target effects .

- Artificial Genomes:
  A synthetic genome is a DNA sequence created artificially. Modern technology including DNA synthesis techniques

SYNTHETIC LIFEFORMS: ROBOTICS MEETS BIOLOGICAL DESIGN

and genome editing instruments like CRISPR-Cas9 are used in its creation. Synthetic genomes are utilized to construct wholly new organisms or to alter and create new biological processes. This can be accomplished by fusing genetic material from several sources or by adding unique genetic code that is not found in the natural world.

Because synthetic genomes make it possible to create microbes that can manufacture particular substances, fight diseases, or flourish in harsh circumstances, they have the potential to transform a number of industries, including biofuel production, agriculture, and medicine. Furthermore, by studying the basic ideas of life and the development of genomes, synthetic genomes help scientists better comprehend the complex interactions that exist between genes, proteins, and their surroundings.

- Biosensors: Biosensors are instruments that use a biological recognition element, such as enzymes or antibodies, in conjunction with a transducer that transforms the biological signal into an electrical or optical signal to detect and measure biological or chemical molecules, such as glucose, DNA, or toxins. Biosensors are used in many fields, such as biodefense, environmental monitoring, food safety testing, and medical diagnostics. Biosensors are used in medicine to identify biomarkers for conditions including diabetes, cancer, and Alzheimer's disease, which enables early diagnosis and therapy. Biosensors in environmental monitoring allow for real-time monitoring and repair by detecting pollutants in water or soil, such as pesticides or heavy metals. Biosensors are used in food safety testing to identify pathogens such as E.

- Immunizations and Medications: Therapeutics and vaccines are two essential medical interventions that are essential to the prevention and treatment of disease. Vaccines work by employing genetic material or pathogens that have been rendered inactive or weakened to produce protection against particular diseases. They have played a significant role in the global eradication of smallpox as well as the prevention of infectious diseases including the mumps, polio, and measles. Additionally, vaccinations have been demonstrated to prevent specific cancer kinds, including the HPV vaccination. Therapeutics, on the other hand, are used to treat or manage illnesses. They are also referred to as treatments or pharmaceuticals. They can be used for diabetes and hypertension, treat .

SYNTHETIC LIFEFORMS: ROBOTICS MEETS BIOLOGICAL DESIGN

infections, and even treat cancer with targeted therapy and chemotherapy

TECHNICAL INTEGRATION: The combination of robotics and synthetic biology has great potential for the dynamic interactions that can occur between robotic platforms and engineered biological systems.

FUTURE REPERCUSSIONS: There are significant ramifications for numerous industries from the combination of robotics and synthetic biology. It offers personalized therapy in the field of healthcare by using sophisticated biosensors and modified cells to monitor patients' conditions in real time.

CONCLUSION: In summary, the fusion of synthetic biology and robotics has the potential to completely alter how we solve challenging issues in a variety of domains. This multidisciplinary partnership has the potential to improve lives throughout the globe and revolutionize industries.

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AI and Data Hygiene: Critical Nexus for Future Innovation

In today's fast-paced digital world, artificial intelligence (AI) has become a key driver of technological progress. AI systems are revolutionising various sectors, including healthcare and finance, by offering deep insights, automating tasks, and enabling new business models. However, the effectiveness that often

AI and Data Hygiene:Critical Nexus for Future Innovation

goes unnoticed: data hygiene. This discussion explores the importance of clean data for AI systems, the challenges in maintaining data hygiene, and strategies to ensure high data quality.

The Importance of Data in AI : AI fundamentally depends on data—large volumes of it. Machine learning models, a branch of AI, are trained on datasets that help them identify patterns, make predictions, and automate decisions. The accuracy and relevance of this data are crucial for optimal AI performance, highlighting the importance of data hygiene.

Data hygiene involves ensuring that datasets are clean, accurate, and relevant. This process includes removing or correcting corrupt, inaccurate, or irrelevant data points. Without proper data hygiene, AI systems can produce inaccurate results, leading to costly errors or unethical outcomes.

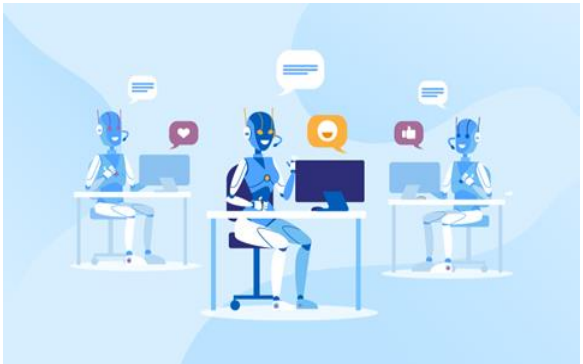

fig 6.1 Al AND HYGIENE

Consequences of Poor Data Hygiene in AI

Reduced Model Performance: AI models trained on erroneous, duplicate, or irrelevant data can yield inaccurate predictions and recommendations. For instance, in healthcare, incorrect patient data can lead to wrong diagnoses or treatment plans, potentially endangering lives.

Bias and Ethical Issues: Poor data hygiene can introduce or amplify biases in AI models. If the training data is biased, the AI system will likely perpetuate that bias, which is particularly problematic in areas like hiring, where biassed data can result in discriminatory practices.

Higher Operational Costs: Managing dirty data can be expensive. Organisations may need to allocate significant resources to clean data before it can be effectively used by AI systems. Additionally, errors caused by poor data hygiene can lead to substantial financial losses and reputational damage**.**

Compliance and Legal Risks: Maintaining data hygiene is crucial for adhering to regulatory standards. Inaccurate or incomplete data can result in non-compliance with regulations such

AI and Data Hygiene: Critical Nexus for Future Innovation

as the General Data Protection Regulation (GDPR), leading to significant fines and legal issues.

Challenges in Ensuring Data Hygiene:

1. **Data Silos**:
   Data is often stored in isolated systems within organisations, leading to inconsistencies. Different departments may have varying versions of the same data. For instance, a customer's information might be updated in the sales database but not in the marketing system, causing discrepancies.
2. **Data Variety and Volume**:
   The vast variety and volume of data generated today, known as big data, present significant challenges for data hygiene. With data coming from multiple sources—such as social media, IoT devices, and customer interactions—ensuring that all this data is clean and consistent can be daunting.
3. **Human Error**:
   Manual data entry is a frequent source of errors in datasets. Typos, incorrect formatting, and outdated information can all compromise data quality. Even automated systems can make mistakes, as they might be misinterpreted.

Strategies for Maintaining Data Hygiene in AI Systems:

Regular Data Audits and Cleaning:

- Conducting regular data audits is essential to identify and fix issues in datasets. This involves checking for duplicates, missing values, outliers, and inaccuracies. While automated tools can help, human oversight is necessary to catch issues that algorithms might miss.

Establishing Data Governance:

- A strong data governance framework is vital for maintaining data hygiene. This includes setting up policies and procedures for data management, such as how data is collected, stored, and processed. It also involves defining roles and responsibilities to ensure accountability for data quality within the organization.

Integrating Data Sources:

- To tackle the problem of data silos, organizations should invest in data integration solutions. These tools consolidate data from various sources into a single, unified dataset, improving data consistency and making it easier to apply data hygiene practices across the organization.

AI and Data Hygiene: Critical Nexus for Future Innovation

Even ML algorithms can be trained to detect and correct errors in datasets.

Regular Data Audits and Cleaning:

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Leveraging AI for Data Cleaning:

Interestingly, AI can be used to enhance data hygiene. Machine learning algorithms can be trained to detect and correct errors in datasets, such as identifying outliers or predicting missing values. AI can also help automate the data cleaning process, making it more efficient and reducing the likelihood of human error.

Fig 6.2 Compliance and Legal Risks

Conclusion: The Future of AI and Data Hygiene

As AI technology continues to evolve and integrate into various sectors, the significance of data hygiene will become even more pronounced. The foundation of AI systems is built on clean, accurate, and relevant data. Without this, the potential for AI to drive innovation and improve lives is greatly diminished. Organizations that prioritize data hygiene will be in a better position to utilize AI effectively, leading to improved decision-making, reduced risks, and ethical outcomes. Conversely, those that overlook data hygiene will encounter increasing difficulties, including poor AI performance and regulatory and ethical challenges.

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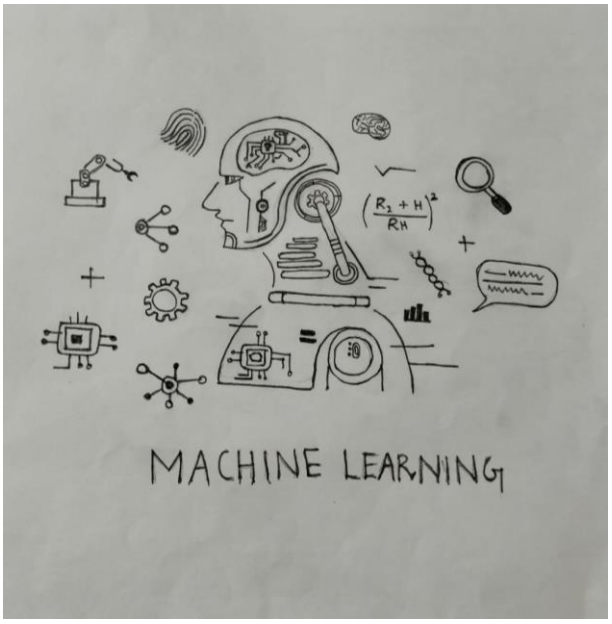
Machine Learning



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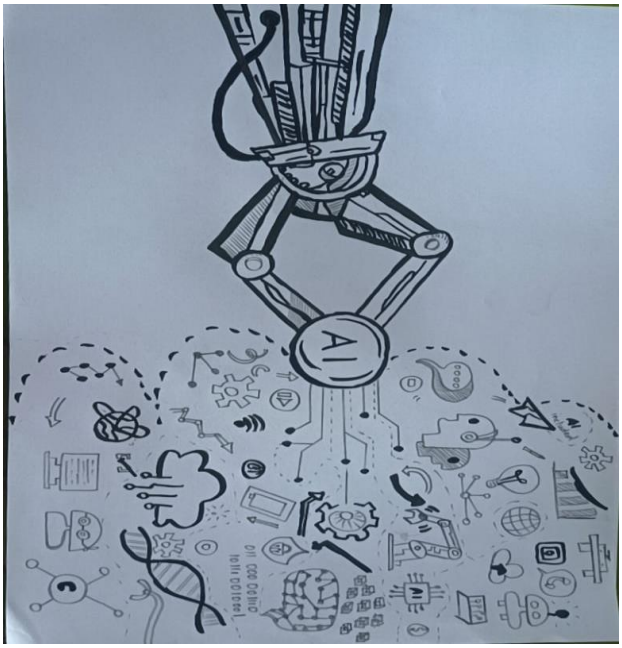
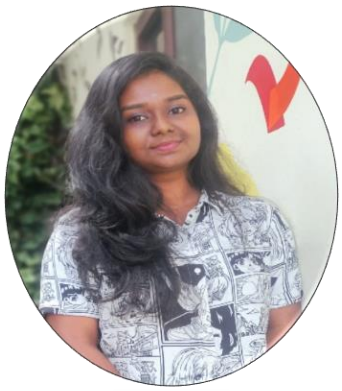
AI





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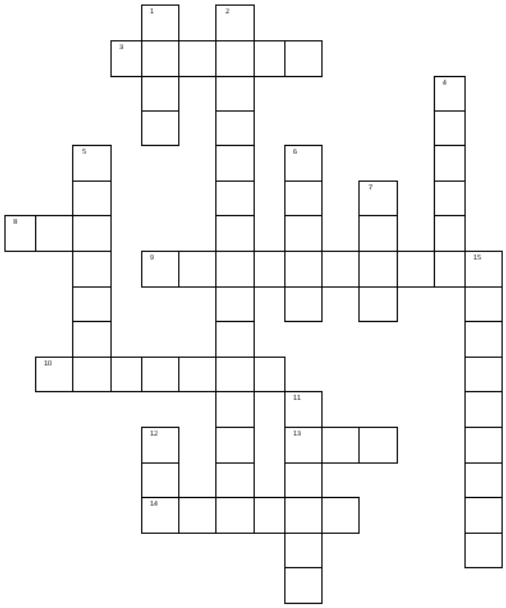
Word fun



*Answer will be revealed in the next issue.

Across:

3. Algorithm for supervised learning, used for grouping data

8. A language used to query a relational database

9. A type of machine learning where models are trained on labelled data

10. The framework for cloud-native apps developed by Google

13. Cryptographic algorithm used for secure transactions

14. Machine learning library in Python developed by Google

Down:

1. Protocol used for sending and receiving email

2.Algorithm for minimising error in neural networks

4.A virtualization technology used for managing virtual machines and servers

5. Popular open-source machine learning library in Python

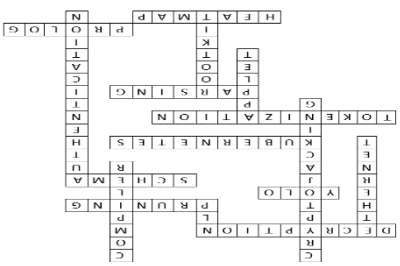
6. A distributed computing framework used for processing

7. A method used to optimize hyperparameters in machine learning

11. Database system designed for handling large-scale data in distributed environments

12. A popular version control system widely used in software development

15. Process of identifying and fixing issues in software



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