

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

$$|\psi\rangle = \alpha|0\rangle + \beta|1\rangle$$

$$H = \frac{1}{\sqrt{2}} \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}$$

$$U = e^{-iHt/\hbar}$$

$$|\phi\rangle = \sum_{x \in \{0,1\}^n} \alpha_x |x\rangle$$

SUPERPOSITION

ENTANGLEMENT

QUANTUM COMPUTING



TECH PULSE

2025-2026



PRAGATI ENGINEERING COLLEGE

1-378, ADB Road, Surampalem-533437

(Approved by AICTE, Permanently Affiliated to JNTUK, KAKINADA & Accredited by NAAC with 'A' Grade)
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VISION

To emerge as a center of technical expertise in the field of computer science and engineering by producing globally competent professionals with technical & research capabilities, ethical values, and team spirit.



MISSION

- M1:** To produce qualified and competent software professionals.
- M2:** To induce application-oriented and research capabilities in students for the betterment of society.
- M3:** To inculcate ethics and human values in students so as to adapt to the dynamism in the field of computing technology.



PROGRAM EDUCATIONAL OBJECTIVES (PEOs):



PEO-1

To provide students with a strong foundation in the mathematical, scientific, and engineering fundamentals necessary to formulate, solve, and analyze engineering problems.



PEO-2

To develop an ability to analyze, design, and develop novel engineering solutions.



PEO-3

To make the students responsible with ethics, best practices, values, and social concerns to meet requirements of responsible team player in the society.



MESSAGE FROM HEAD OF THE DEPARTMENT

Dr. D.V.Manjula
Professor & HoD of CSE,
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My vision is to nurture the creative thinking, analytical skills, and entrepreneurial mindset of every CSE student. Our department is dedicated to delivering quality engineering education, empowering students to build successful careers in industry, academia, and research while contributing to economic growth and creating meaningful employment opportunities through innovation.



With more than a decade of experience in teaching and research, I continuously strive to blend theoretical knowledge with practical exposure, fostering a dynamic learning environment. Together with our committed faculty, we focus on holistic development that strengthens technical competence and professional skills.



Our goal is to cultivate young minds with strong ethics, values, and a sense of social responsibility, preparing them to meet future technological challenges and contribute to the betterment of society and the nation.

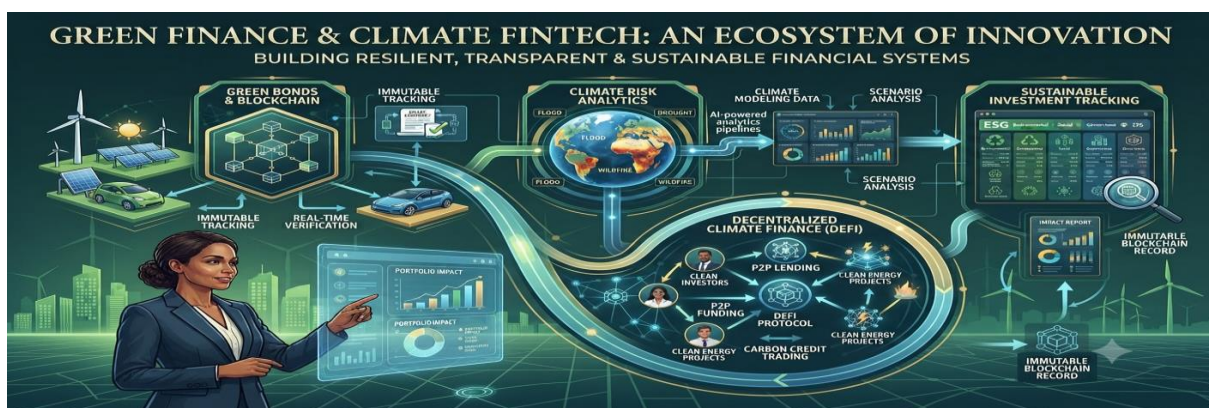


Green Finance And Climate Fintech: Building Sustainable Financial Systems With Blockchain

Dr.D.V.Manjula
Associate Professor,CSE Department

The increasing impact of climate change has created an urgent need for sustainable financial systems that support environmental protection and green economic growth. Traditional financial systems often face challenges such as lack of transparency, inefficient tracking of green investments, and difficulty verifying environmental impact. Green Finance and Climate FinTech are emerging as innovative solutions that combine financial technology with sustainability goals.

Green Finance refers to financial activities that support environmentally sustainable projects such as renewable energy, carbon reduction, clean transportation, and sustainable agriculture. Climate FinTech uses advanced technologies including blockchain, Artificial Intelligence (AI), big data, and digital platforms to improve climate-related financial services and investment management.



Climate risk analytics is another important component of Climate FinTech. Financial institutions and investors need accurate information about climate-related risks such as floods, droughts, rising temperatures, and carbon regulations.

Sustainable investment tracking is becoming increasingly important as investors seek environmentally responsible opportunities. Blockchain provides immutable records of investment transactions and sustainability performance. Investors can track the environmental impact of projects and monitor whether organizations meet ESG (Environmental, Social, and Governance) standards. This improves trust and accountability in green investment markets.

Decentralized Climate Finance (DeFi) is transforming sustainable financial systems by enabling peer-to-peer climate investments without traditional intermediaries such as banks. Blockchain-powered DeFi platforms provide transparent and secure access to climate funding, renewable energy projects, and carbon credit trading systems. These decentralized systems reduce transaction costs and increase financial accessibility for sustainable initiatives.

Energy Trading and Renewable Energy Certificates: Powering a Sustainable Future

Mr. K. Chandrasekhar

Associate Professor, CSE Department

The growing demand for clean and sustainable energy has transformed the global energy sector. Governments, industries, and consumers are increasingly shifting toward renewable energy sources such as solar, wind, hydro, and biomass to reduce dependence on fossil fuels and minimize carbon emissions. In this transition, energy trading and Renewable Energy Certificates (RECs) play a significant role in promoting green energy adoption and supporting environmental sustainability. Energy trading refers to the buying and selling of electricity, renewable power, and related energy products in regulated or open markets. It enables energy producers, suppliers, and consumers to exchange electricity efficiently based on market demand and supply conditions. Modern energy trading systems use digital platforms, smart grids, and real-time data analytics to optimize electricity distribution and reduce energy wastage.

Renewable Energy Certificates are market-based instruments that represent proof that one megawatt-hour (MWh) of electricity has been generated from renewable energy sources. When renewable energy producers generate electricity, they receive RECs that can be sold separately from the actual electricity. Companies and organizations purchase these certificates to demonstrate their commitment to sustainability and meet renewable energy goals.

One of the major advantages of RECs is that they encourage investment in renewable energy projects. By creating an additional source of revenue for green energy producers, RECs support the development of solar farms, wind power plants, and other sustainable energy infrastructures. This helps accelerate the global transition toward low-carbon energy systems. Energy trading platforms also improve grid efficiency and energy management. Smart technologies such as Artificial Intelligence (AI), blockchain, and Internet of Things (IoT) devices enable real-time monitoring of energy production and consumption. These technologies help balance electricity demand, reduce transmission losses, and ensure reliable energy distribution across regions.

Despite these advantages, energy trading and REC systems face several challenges. Market volatility, regulatory differences between countries, high infrastructure costs, and the integration of renewable energy into existing power grids remain significant concerns. In addition, accurate monitoring and standardized certification systems are essential for maintaining trust and efficiency in renewable energy markets.

Governments and international organizations are continuously introducing policies and incentives to strengthen renewable energy trading systems. Many countries have established renewable energy targets and carbon reduction commitments that encourage industries to adopt RECs and sustainable energy practices.

In conclusion, energy trading and Renewable Energy Certificates are essential tools for achieving global sustainability goals.

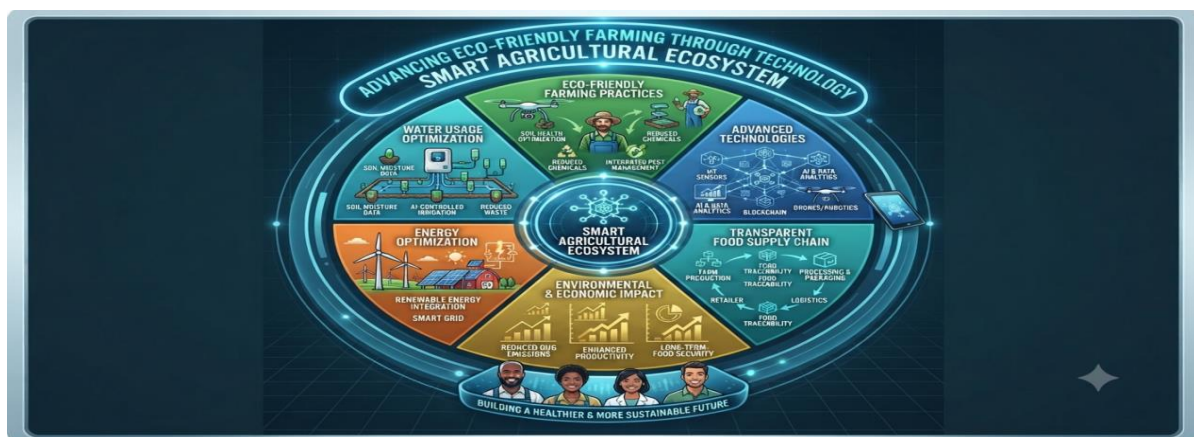
Sustainable Agriculture And Food Systems: Advancing Eco-Friendly Farming Through Technology

Dr. D.Uma

Associate Professor, CSE Department

Agriculture is one of the most important sectors supporting global food security and economic development. However, farming activities also contribute significantly to greenhouse gas emissions, water consumption, and environmental degradation. The increasing demand for food production has created a need for sustainable agricultural systems that balance productivity with environmental protection. Modern technologies are helping transform traditional farming into a more efficient, transparent, and eco-friendly system through sustainable agriculture and food management practices.

Sustainable agriculture focuses on reducing environmental impact while maintaining long-term agricultural productivity. It encourages responsible resource usage, reduced chemical dependence, and environmentally friendly farming techniques. Digital technologies such as blockchain, IoT sensors, Artificial Intelligence (AI), and data analytics are improving the monitoring and management of agricultural operations.



Water usage optimization is essential for sustainable farming, especially in regions facing water scarcity. IoT-based irrigation systems and AI-powered monitoring tools help farmers manage water resources efficiently by analyzing soil moisture, weather conditions, and crop requirements. These technologies reduce water wastage and improve agricultural sustainability.

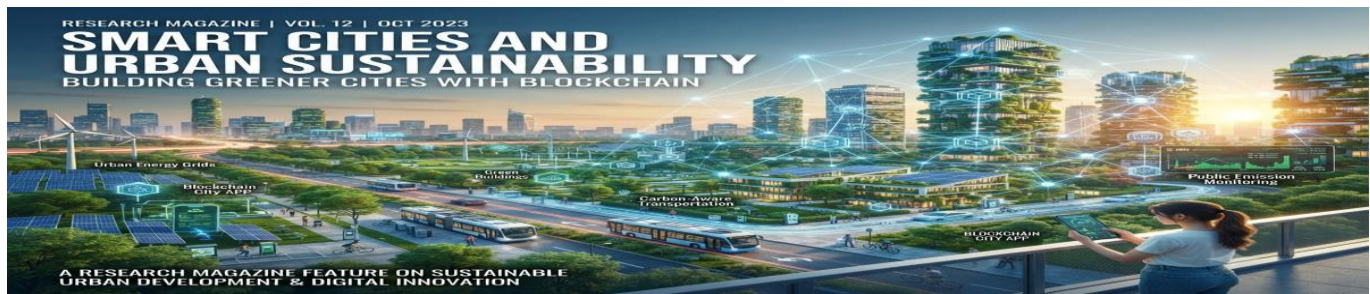
Farm-to-table sustainability focuses on maintaining transparency and environmental responsibility throughout the food supply chain. Sustainable supply chain systems track food products from farms to consumers, ensuring ethical production, reduced emissions, and responsible transportation practices.

In conclusion, sustainable agriculture and food systems are essential for protecting natural resources, reducing emissions, and ensuring long-term food security. By integrating advanced technologies with eco-friendly farming methods, agriculture can become more productive, transparent, and environmentally responsible.

Smart Cities And Urban Sustainability: Building Greener Cities With Blockchain

Dr. A. Avinash
Associate Professor, CSE Department

Rapid urbanization has increased the demand for efficient transportation, energy management, and sustainable infrastructure in modern cities. Growing populations and industrial activities have also led to higher carbon emissions, pollution, traffic congestion, and resource consumption. To address these challenges, smart cities are adopting advanced technologies such as blockchain, Internet of Things (IoT), Artificial Intelligence (AI), and data analytics to create sustainable urban environments. Blockchain technology, in particular, is playing an important role in improving transparency, security, and efficiency in urban sustainability systems.



One of the major applications of blockchain in smart cities is carbon-aware transportation systems. Transportation is one of the largest contributors to urban carbon emissions. Blockchain-based systems can monitor fuel consumption, traffic flow, and vehicle emissions in real time. Governments and transportation agencies can use this data to encourage low-carbon transportation methods and reduce environmental impact.

Smart mobility tracking is another important aspect of sustainable urban infrastructure. Blockchain integrated with IoT sensors and GPS technologies allows secure tracking of public transportation, ride-sharing services, bicycles, and electric vehicles. These systems improve traffic management, reduce congestion, and support eco-friendly transportation solutions. Citizens can also access transparent transportation data for better route planning and energy-efficient travel.

Green building certification systems are becoming increasingly important in sustainable urban development. Buildings consume large amounts of energy and contribute significantly to greenhouse gas emissions. Blockchain technology helps maintain secure records of construction materials, energy usage, and environmental compliance standards. Smart contracts can automate certification processes for eco-friendly buildings, improving transparency and reducing administrative complexity.

In conclusion, blockchain technology is transforming smart cities by improving transparency, efficiency, and sustainability in urban infrastructure systems. Through applications such as carbon-aware transportation, green building certification, urban energy optimization, and public emission monitoring, blockchain supports cleaner and smarter urban development.

Waste Management And Circular Economy Using Blockchain: Creating A Sustainable Future

Mr.Y.Manas Kumar
Asst. Professor, CSE Department

Rapid industrial growth and increasing consumer demand have led to a significant rise in global waste generation. Plastic pollution, electronic waste, and inefficient disposal systems are creating serious environmental challenges. Traditional waste management systems often lack transparency, proper tracking, and efficient recycling mechanisms. Blockchain technology is emerging as an innovative solution for improving waste management and supporting the circular economy by enabling secure, transparent, and traceable recycling systems.

A circular economy focuses on reducing waste by reusing, recycling, and recovering resources instead of following the traditional “use and dispose” model. Blockchain technology helps achieve this goal by creating decentralized and tamper-proof digital records for waste tracking, recycling, and resource management. Every transaction or movement of waste materials can be securely recorded and verified on the blockchain network.

One of the major applications of blockchain in waste management is plastic waste tracking. Millions of tons of plastic waste enter oceans and landfills every year due to poor disposal systems. Blockchain platforms allow organizations and governments to track plastic waste from production to recycling. This improves accountability and ensures that recyclable materials are processed properly instead of being discarded illegally.

E-waste recycling systems also benefit from blockchain integration. Electronic waste contains valuable materials such as copper, aluminum, and rare metals, but improper disposal can release toxic chemicals into the environment. Blockchain-based systems help track electronic products throughout their lifecycle, ensuring safe recycling and responsible disposal practices. Manufacturers and recycling companies can maintain transparent records of e-waste collection and material recovery.

Incentive-based recycling tokens are becoming increasingly popular in blockchain-powered waste management systems. Individuals and organizations can receive digital rewards or tokens for participating in recycling activities. These blockchain-based incentives encourage responsible waste disposal and improve public participation in sustainability programs. Such systems can significantly increase recycling rates in urban and industrial areas.

Blockchain also supports waste-to-energy systems by improving the monitoring and management of waste conversion processes. Organic and industrial waste can be converted into electricity, heat, or biofuels. Blockchain ensures transparent tracking of energy generation and waste utilization, helping governments and industries measure environmental impact accurately.

In conclusion, blockchain technology is transforming waste management and supporting the circular economy through secure and transparent recycling systems. By enabling waste tracking, circular supply chains, incentive-based recycling, and smart waste management, blockchain promotes environmental sustainability and resource efficiency.

Blockchain-Powered Carbon Credit Management: Building Trust In Climate Action

G.Vijay Kumar
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As the world races to reduce greenhouse gas emissions, carbon credits have emerged as a vital mechanism for encouraging sustainable practices. A carbon credit represents permission to emit a certain amount of carbon dioxide, and organizations that reduce emissions can trade these credits in carbon markets. However, traditional carbon credit systems often face challenges such as double counting, lack of transparency, fraud, delayed verification, and inefficient record management. The integration of blockchain technology into carbon credit management offers a transformative solution to these problems.

Blockchain is a decentralized digital ledger that records transactions securely and transparently. Every transaction is stored in blocks connected chronologically, making the data nearly impossible to alter. By applying blockchain to carbon credit systems, governments, industries, and environmental organizations can create a transparent and tamper-proof platform for tracking carbon emissions and credit trading.

One of the greatest advantages of blockchain-based carbon credit management is transparency. In conventional systems, verifying whether a carbon credit has already been used or sold can be difficult. Blockchain provides a shared ledger where every transaction is visible and traceable in real time. This reduces the risk of fraud and ensures that each carbon credit is unique and accounted for only once. Blockchain also strengthens trust among stakeholders. Investors, environmental agencies, and consumers can verify sustainability claims through immutable digital records. For example, companies can demonstrate their carbon reduction achievements with verified blockchain data, enhancing corporate accountability and environmental credibility.

Furthermore, blockchain can support global climate goals by enabling international carbon trading with standardized and reliable data. Developing countries and small-scale renewable energy projects can participate more easily in global carbon markets, increasing financial opportunities for sustainable development initiatives. Despite its advantages, blockchain-based carbon credit management faces certain challenges. High energy consumption in some blockchain networks, regulatory uncertainty, scalability issues, and the need for global standards remain key concerns. However, newer eco-friendly blockchain models and government collaborations are helping overcome these obstacles.

Several organizations and startups are already exploring blockchain for climate solutions. Platforms are being developed to tokenize carbon credits, allowing them to be traded digitally with increased security and accessibility. These innovations could revolutionize environmental governance and accelerate the transition toward a low-carbon economy.

In conclusion, blockchain technology has the potential to significantly improve carbon credit management by enhancing transparency, security, efficiency, and trust. As climate change continues to threaten global ecosystems and economies, integrating blockchain into environmental sustainability efforts can create more reliable carbon markets and encourage responsible climate action.

Iot And Blockchain For Emission Monitoring: Transforming Environmental Sustainability

Mr.K.V.V.Subba Rao
Asst. Professor, CSE Department

Rapid industrialization and urban growth have significantly increased pollution and carbon emissions across the world. To address environmental challenges effectively, advanced digital technologies such as the Internet of Things (IoT) and blockchain are being integrated to create intelligent and transparent emission monitoring systems. The combination of IoT sensors and blockchain technology enables secure, accurate, and real-time environmental monitoring, helping industries and governments achieve sustainability goals.

IoT technology plays a vital role in collecting environmental data through smart sensors installed in factories, vehicles, agricultural fields, and urban areas. These sensors continuously measure parameters such as carbon dioxide levels, air quality, temperature, smoke emissions, and industrial pollutants. Sensor-based carbon data collection allows organizations to monitor environmental conditions with greater precision and efficiency compared to traditional manual systems.

One of the most important benefits of integrating IoT with blockchain is real-time pollution monitoring. IoT sensors can instantly transmit environmental data to blockchain platforms where regulators, industries, and environmental agencies can access verified information. Real-time monitoring helps authorities quickly identify pollution sources, detect abnormal emission levels, and take immediate corrective actions to reduce environmental damage.

Edge computing further enhances sustainability-focused monitoring systems. Instead of sending all sensor data to centralized cloud servers, edge computing processes data near the source using local devices. This reduces network delays, improves response time, and lowers energy consumption. By combining edge computing with IoT and blockchain, industries can achieve faster and more energy-efficient environmental monitoring solutions.

Industrial emission auditing is another major application of IoT and blockchain integration. Industries are often required to submit environmental compliance reports to government agencies. Blockchain-based auditing systems create transparent and verifiable records of emissions, reducing the possibility of false reporting or data manipulation. Regulatory authorities can easily track industrial pollution levels and ensure compliance with environmental standards.

Despite its advantages, the adoption of IoT and blockchain for emission monitoring faces challenges such as high implementation costs, cybersecurity concerns, data storage requirements, and the need for standardization. However, ongoing technological advancements and increasing environmental awareness are encouraging industries to invest in smart sustainability solutions.

In conclusion, the integration of IoT sensors with blockchain technology is revolutionizing emission monitoring by providing secure, transparent, and real-time environmental data management. These technologies not only improve pollution control and industrial accountability but also contribute to global sustainability efforts.

Green Blockchain And Sustainable Consensus Mechanisms: Building Eco-Friendly Digital Networks

Mr..K.Sayatankar

Asst. Professor, CSE Department

Blockchain technology has revolutionized digital transactions, cryptocurrencies, and decentralized systems. However, traditional blockchain networks, especially those using Proof of Work (PoW), consume enormous amounts of electricity due to complex computational processes. This high energy consumption has raised environmental concerns and increased the demand for greener alternatives. As sustainability becomes a global priority, Green Blockchain and sustainable consensus mechanisms are emerging as essential solutions for creating environmentally responsible digital ecosystems.

A consensus mechanism is the process through which blockchain networks validate transactions and maintain security. Traditional Proof of Work systems require powerful computers to solve mathematical problems, leading to excessive electricity usage and carbon emissions. To overcome these challenges, modern blockchain platforms are adopting energy-efficient consensus algorithms that significantly reduce power consumption while maintaining network security and decentralization.

One of the most popular sustainable alternatives is Proof of Stake (PoS). In this mechanism, validators are selected based on the amount of cryptocurrency they hold and “stake” in the network rather than solving energy-intensive puzzles. Since PoS eliminates the need for massive computational power, it consumes far less energy compared to Proof of Work systems. This makes PoS an environmentally friendly and cost-effective blockchain solution.

Another important mechanism is Proof of Authority (PoA), where trusted validators are authorized to verify transactions and maintain the blockchain network. PoA requires minimal computing resources, making it highly energy efficient. It is commonly used in private or enterprise blockchain systems where transparency and low energy consumption are important priorities.

The adoption of green blockchain technology is creating new opportunities for sustainable cryptocurrency systems. Eco-friendly cryptocurrencies designed with energy-efficient consensus mechanisms reduce environmental impact while supporting secure digital transactions. These systems are becoming increasingly attractive to environmentally conscious investors and organizations.

Green blockchain is also enabling the development of eco-friendly decentralized applications (dApps). These applications support sustainable services such as carbon credit trading, renewable energy management, smart agriculture, and environmental monitoring. By combining decentralization with energy efficiency, green blockchain technology promotes both technological innovation and environmental responsibility.

In conclusion, Green Blockchain and sustainable consensus mechanisms are transforming the future of digital technology by reducing energy consumption and promoting environmental sustainability.

Supply Chain Carbon Tracking: Driving Sustainable Business Through Technology

Mr.S.K.Sankar
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In today's global economy, supply chains play a crucial role in the production and distribution of goods. However, they are also major contributors to carbon emissions due to transportation, manufacturing, packaging, and energy consumption. As industries strive to meet environmental goals and reduce their carbon footprint, supply chain carbon tracking has become an essential strategy for achieving sustainability and transparency.

Supply chain carbon tracking refers to the process of monitoring, measuring, and managing greenhouse gas emissions generated throughout the lifecycle of a product or service. From raw material extraction to manufacturing, transportation, storage, and final delivery, every stage of the supply chain contributes to environmental impact. Accurate tracking helps organizations identify emission sources and implement effective carbon reduction strategies.

Traditional methods of carbon tracking often rely on manual reporting and fragmented data systems, making the process slow, inaccurate, and difficult to verify. Modern technologies such as the Internet of Things (IoT), Artificial Intelligence (AI), cloud computing, and blockchain are transforming supply chain carbon management by enabling real-time monitoring and secure data sharing.

One of the key benefits of supply chain carbon tracking is enhanced transparency. Companies can collect emission data from suppliers, transporters, and production facilities to gain a complete view of their environmental impact. This transparency helps businesses comply with environmental regulations and sustainability standards while improving accountability across the supply chain network.

Another major advantage is improved decision-making. Organizations can use carbon data to evaluate suppliers based on sustainability performance and select eco-friendly partners. Businesses can also design greener supply chains by adopting recyclable materials, energy-efficient manufacturing methods, and low-emission transportation systems.

Supply chain carbon tracking is especially important as governments worldwide introduce stricter climate regulations and carbon reporting requirements. Companies that actively reduce emissions not only contribute to environmental protection but also gain competitive advantages through stronger brand reputation and customer loyalty.

Despite its benefits, implementing carbon tracking systems presents challenges such as data integration issues, high initial investment costs, lack of standardized reporting frameworks, and limited cooperation among supply chain partners. However, increasing awareness of climate change and advancements in digital technology are encouraging organizations to adopt sustainable tracking solutions.

By combining advanced technologies with responsible business practices, companies can build transparent, efficient, and eco-friendly supply chains.

Machine Learning Techniques for Alzheimer's disease Detection from MRI Images

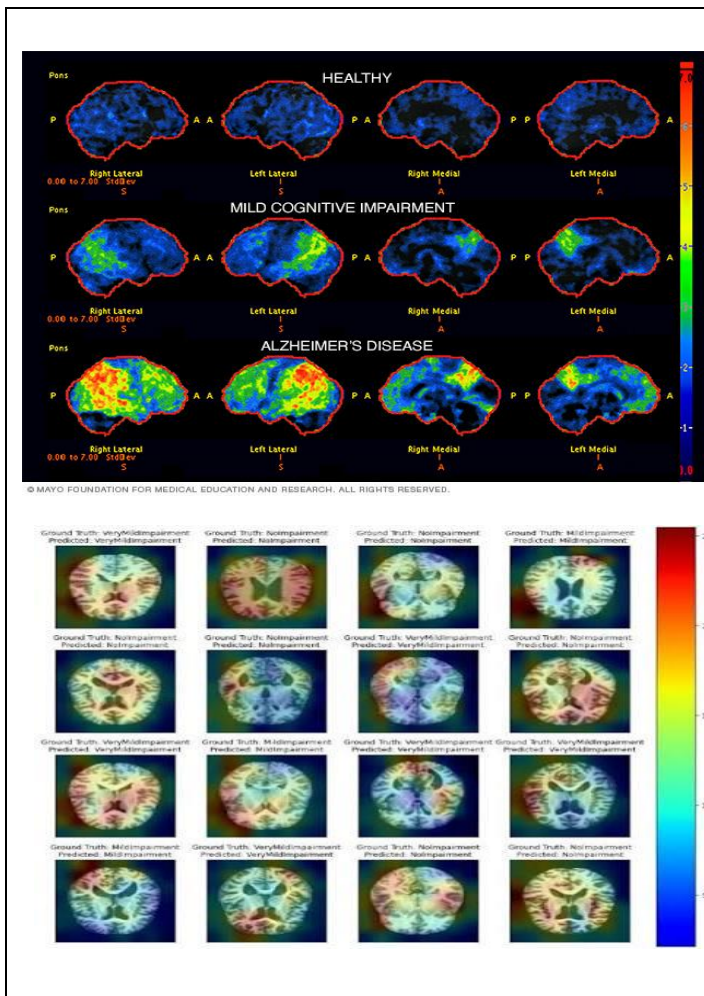
Mrs.T N V Durga

Asst Prof, CSE Department

Alzheimer's disease is a condition that affects the brain and causes changes in behavior and memory loss while making it hard to carry out tasks properly. It's vital to spot the illness early, for effective treatment. MRI technology has advanced in detecting Alzheimer's by using machine learning and deep learning models.

Machine learning techniques such as convolutional neural networks (CNNs), ensemble learning, and transfer learning are currently the most effective approaches for detecting Alzheimer's disease from MRI scans, enabling early diagnosis by identifying subtle structural changes in the brain. These methods outperform traditional statistical models by leveraging deep feature extraction and multimodal data integration.

Effected Alzheimer's disease



- A **dataset** is simply a structured collection of data — in this case, a set of **MRI brain images** along with labels (such as *healthy*, *mild cognitive impairment*, or *Alzheimer's disease*).
- Public datasets allow researchers to compare methods under the same conditions.
- **Feature extraction** Datasets provide diverse brain structures, enabling algorithms to identify consistent biomarkers (e.g., hippocampal shrinkage).

Key Advantages

- Early detection
- High accuracy
- Automation
- Feature discovery

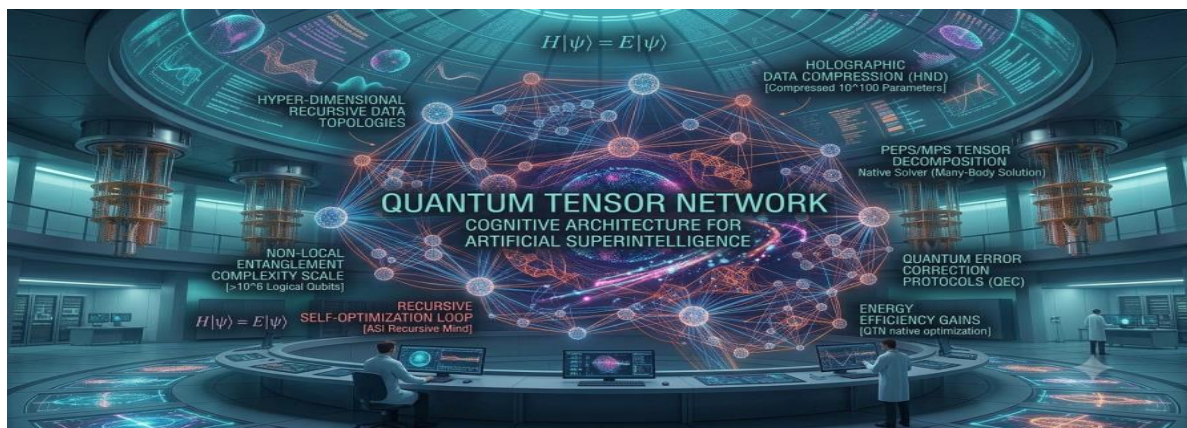
Quantum Tensor Networks for Artificial Superintelligence

Mrs.P.Lakshmi Satya

Asst Prof, CSE Department

In the 2030s, the journey toward sustainable Artificial Superintelligence (ASI) faces a monumental barrier: traditional deep learning architectures cannot handle the parameter explosion required for sovereign reasoning. The energy and classical compute needed are prohibitive. **Quantum Tensor Networks (QTNs)** provide the key. By using the mathematics of quantum entanglement to structure and compress hyper-dimensional data, QTNs offer the only native computational architecture scalable enough to fuel the cognitive demands of a superintelligence.

Traditional deep learning stores data in flat, massive tensors, causing computational costs to grow exponentially with data complexity. QTNs resolve this by decomposing these massive tensors into networks of smaller, interconnected nodes. Critically, these connections correspond to quantum entanglement bonds, compressing the data geometry. Complex data states are mapped onto Matrix Product States (MPS), allowing an ASI to efficiently manipulate hyper-dimensional structures that would be physically impossible to manage with classical bits.



QTNs eliminate the "curse of dimensionality." Because they operate in the native topological geometry of quantum states, QTNs allow an ASI to perform complex linear algebra operations across vast, interconnected datasets simultaneously. This creates a hyper-exponential scaling law, enabling the ASI to recursively improve its own code and absorb global systemic data without hitting a classical compute ceiling. The machine's thinking becomes defined not by sequential processing, but by the emergent properties of entangled data topologies.

The shift to QTNs dissolves the software/hardware divide. ASI learning mimics condensed matter physics. By focusing compute only along the entanglement bonds, QTNs eliminate redundant parameters, reducing the energetic footprint of hyper-scale models by orders of magnitude. The future of ASI is not larger data centers, but a mastery of information geometry, allowing a sustainable singularity to emerge through the efficient structuring of subatomic relationships.

Quantum Church-Turing Thesis Frontiers

Mrs.P.Kanaka Tulasi

Asst Prof, CSE Department

For nearly a century, the Extended Church-Turing Thesis served as a fundamental pillar of computer science, asserting that any physical computation can be efficiently simulated by a classical Turing machine. However, as the world enters the 2030s, the realization of fault-tolerant quantum computers has pushed this thesis to its absolute breaking point. The boundary between theoretical physics and pure computation is blurring, giving rise to systems that process information in ways that classical physics cannot mathematically replicate, fundamentally shifting our understanding of what is computable in our universe.

The ultimate frontier of the Quantum Church-Turing thesis is the empirical proof that quantum systems violate classical efficiency constraints. In the past, complex physical systems—such as highly entangled subatomic interactions or macro-chaotic climate systems—were deemed too complex to simulate exactly, requiring massive, sub-optimal approximations. Today, scalable quantum processors exploit non-local entanglement and infinite-dimensional Hilbert spaces to solve these non-deterministic polynomial-time (NP) hard problems natively, proving that the universe operates on an underlying computational architecture that classical logic simply cannot scale to meet.

By operating beyond the classical Church-Turing threshold, quantum architectures allow researchers to simulate physical matter with absolute fidelity. Rather than merely calculating formulas, a quantum simulator *becomes* the physical system itself, mapping the exact quantum states of complex molecules, superconductors, and event horizons. This cross-over from abstract mathematical modeling to exact physical replication opens a profound philosophical question: if a machine can perfectly simulate the quantum properties of a physical environment, does the boundary between a simulated reality and physical truth cease to exist?

The breakdown of the classical thesis has major implications for the evolution of Artificial Superintelligence (ASI). Traditional AI is fundamentally bound by Turing-equivalent architecture, limiting its cognitive scaling laws to the processing constraints of classical silicon. Hybrid systems that integrate quantum-native algorithms bypass these algorithmic ceilings entirely. An intelligence operating on quantum-extended principles does not think in linear sequences; it evaluates multi-variable probabilities simultaneously, rewriting its own code at a subatomic baseline that classical human observers can neither track nor mathematically intercept.

As we push past the classical boundaries of computer science, the ultimate destination of the Quantum Church-Turing frontier is a radical rewriting of cosmology. Physicists and computational theorists increasingly view the universe not as a collection of physical objects moving through space, but as a vast, decentralized quantum computer executing its own cosmic codebase. Navigating the ethics and mechanics of this frontier requires recognizing that our computing machines are no longer just tools for calculation—they are mirrors reflecting the deepest, non-classical laws of reality itself.

Directions in Quantum Computing Ethics in 2030's and Beyond

Ms.A.Harini

Asst Prof, CSE Department

As fault-tolerant quantum systems graduate from experimental laboratories to mainstream sovereign infrastructures in the 2030s, society faces a technological paradigm shift unlike any other. While classical artificial intelligence has already transformed global industry, the introduction of native quantum computation alters the very fabric of machine reasoning, data security, and geopolitical power dynamics. These advancements necessitate an immediate, rigorous evaluation of quantum computing ethics to govern a future where traditional computational boundaries cease to exist.

One of the most profound ethical challenges lies in what researchers call "the black box squared"—the crisis of unexplainable logic in Quantum Artificial Intelligence (QAI). When advanced machine learning algorithms operate natively across multi-dimensional quantum states using superposition and entanglement, their mathematical workflows become fundamentally non-linear. If a quantum-driven system denies a financial loan, alters a military strategy, or prescribes an autonomous medical treatment, it does so using high-dimensional Hilbert space logic that is physically impossible to reverse-engineer or audit on classical hardware, forcing us to question if we can ethically deploy an intelligence we cannot cross-examine.

In security environments, a silent crisis looms regarding data longevity and retroactive vulnerability. For over a decade, adversarial state actors and criminal syndicates have utilized a strategy known as "Harvest Now, Decrypt Later" (HNDL), quietly intercepting and storing massive streams of encrypted global communications. As practical fault-tolerant processors capable of running Shor's algorithm scale up in the 2030s, decades of historical health records, personal identities, and corporate secrets will instantly become transparent. This creates an unprecedented liability dilemma for data custodians who failed to transition to post-quantum cryptography early enough.

Beyond individual data privacy, quantum computing risks amplifying global inequality by dividing the world into distinct geopolitical classes. The immense capital, specialized cryogenic infrastructure, and rare scientific talent required to maintain processing units near absolute zero are heavily concentrated within a handful of wealthy nations and tech monopolies. Without active international treaties or open-access initiatives, the "Quantum Haves" will entirely dominate molecular medicine, hyper-optimized financial markets, and advanced material synthesis, while the "Quantum Have-Nots" will suffer from obsolete cybersecurity and permanent economic dependency.

As leading tech companies and global research institutions push the frontiers of physical qubit scaling, policy makers must establish strict, non-negotiable international guardrails. This includes mandating quantum-fair verification frameworks to audit hybrid systems before public deployment, crafting sovereign technology treaties modeled after nuclear non-proliferation to prevent the weaponization of quantum surveillance, and requiring cloud providers to subsidize processing time for humanitarian research.

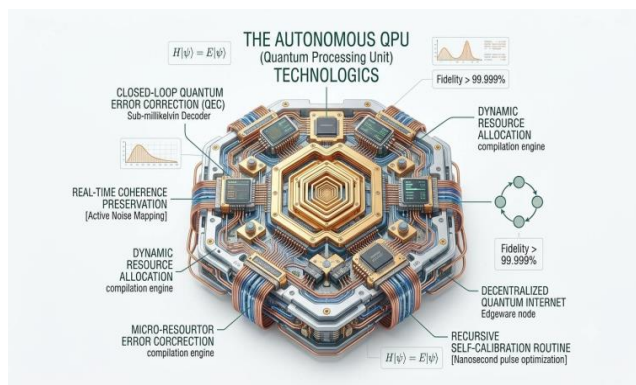
Autonomous QPU (Quantum Processing Units) Technologies

Mrs.K.Sham Sri

Asst Prof, CSE Department

For decades, operating a Quantum Processing Unit (QPU) required an entire team of specialized physicists, room-sized dilution refrigerators, and constant, manual calibration to stave off environmental noise. As we push deeper into the 2030s, this paradigm has completely shifted with the advent of **Autonomous QPUs**. Equipped with native, closed-loop machine learning sub-systems operating directly at cryogenic baselines, these next-generation processors manage their own stability, error correction, and pulse calibrations in real time—marking the birth of plug-and-play quantum infrastructure.

The primary barrier to practical quantum computing has always been environmental decoherence. Autonomous QPUs solve this by embedding dedicated classical neural network chips—or specialized neuromorphic microcontrollers—right alongside the quantum infrastructure inside the dilution refrigerator. These embedded agents continuously monitor qubit frequencies and phase drifts. By applying micro-adjustments to the control pulses in nanoseconds, the processor dynamically neutralizes localized magnetic or thermal fluctuations, extending qubit coherence windows indefinitely without halting running computations.



Traditional quantum error correction relies on sending massive amounts of syndrome measurement data out of the refrigerator to external classical servers, creating a catastrophic data bottleneck. Autonomous QPUs run local, hardware-level decoding loops directly within the control hardware. By analyzing error syndromes and executing physical gate corrections natively at the millikelvin stage, the processor prevents error propagation at subatomic

speeds, paving the way for truly fault-tolerant execution on millions of physical qubits simultaneously.

Beyond pure physical upkeep, Autonomous QPUs act as intelligent schedulers within hybrid cloud data centers. When an algorithmic task is submitted, the QPU's internal telemetry evaluates its own physical layout, isolating qubits that are experiencing higher noise rates. It then dynamically reroutes and compiles the quantum circuit onto the healthiest clusters of qubits on the chip. This continuous self-optimization ensures maximum gate fidelity, allowing commercial enterprises to execute complex molecular simulations or financial optimizations without needing internal hardware expertise.

The autonomy of these processors unlocks the true potential of the Quantum Internet. By taking over their own stabilization and handshake protocols, Autonomous QPUs can operate as independent nodes in a decentralized quantum cryptographic or computing network. As compact, closed-cycle cryostats become commercially standard, autonomous QPUs will migrate out of highly protected corporate labs and into edge-computing facilities, remote satellite links, and sovereign defense infrastructures—firmly establishing quantum power as an accessible, self-sustaining utility

Esg Reporting Using Blockchain: Enhancing Transparency And Sustainability

Mrs. K. Mahalakshmi
Asst. Professor, CSE Department

Environmental, Social, and Governance (ESG) reporting has become a critical part of modern business practices. Investors, governments, and consumers increasingly expect organizations to demonstrate responsible environmental performance, ethical governance, and social accountability. However, traditional ESG reporting systems often face challenges such as inaccurate data, lack of transparency, delayed verification, and manipulation of sustainability records.

Blockchain is a decentralized digital ledger that securely records transactions and data in immutable blocks. Once information is added to the blockchain, it cannot be altered or deleted without network validation. This feature makes blockchain highly suitable for sustainability reporting, where accuracy and accountability are essential.

Immutable sustainability reporting is another significant advantage of blockchain technology. Companies can securely record carbon emissions, waste management activities, energy consumption, and social responsibility initiatives on blockchain platforms. Since the records cannot be modified, stakeholders can trust the authenticity of sustainability data. This reduces the possibility of greenwashing, where companies falsely claim environmentally friendly practices.

Blockchain also improves green finance transparency. Sustainable investment projects often require accurate verification of environmental impact before receiving funding. Blockchain-based systems allow investors and financial institutions to track how funds are used in renewable energy, carbon reduction, and sustainability projects. Transparent financial tracking increases investor confidence and promotes responsible investment practices.

Digital sustainability auditing becomes more efficient through blockchain integration. Traditional auditing processes are time-consuming and dependent on centralized records that may be incomplete or inaccurate. Blockchain provides real-time access to verified environmental and governance data, enabling faster and more reliable auditing procedures. Auditors and regulators can monitor sustainability performance continuously rather than relying solely on periodic reports.

Corporate emission accountability is another important application of blockchain-enabled ESG systems. Companies can use blockchain platforms to monitor greenhouse gas emissions across manufacturing plants, supply chains, and transportation networks. Real-time and tamper-proof emission records help organizations identify pollution sources and improve environmental performance while complying with climate regulations.

Despite its advantages, blockchain-based ESG reporting faces challenges such as implementation costs, data integration issues, regulatory uncertainty, and scalability concerns. However, continuous advancements in blockchain technology are helping organizations overcome these limitations and improve sustainability management systems.

Kubernetes Architecture

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Kubernetes is an open-source container orchestration platform that automates the deployment, scaling, and management of containerized applications. Its architecture is divided into two main components: the Control Plane and Worker Nodes.

The Control Plane acts as the brain of the Kubernetes cluster. It consists of:

- API Server – Receives and processes user requests.
- Scheduler – Assigns workloads (Pods) to suitable worker nodes.
- Controller Manager – Maintains the desired state of the cluster.
- etcd – A distributed key-value store that holds cluster configuration and state information.

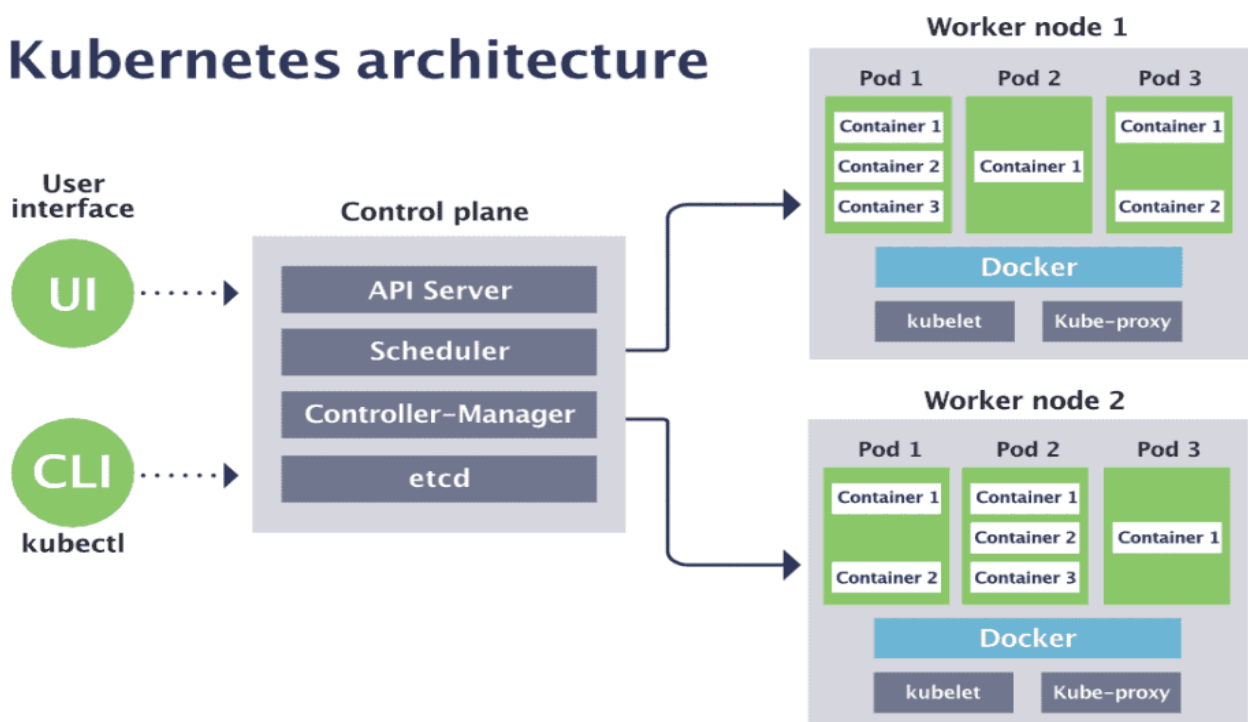
Users interact with Kubernetes through a User Interface (UI) or the kubectl Command Line Interface (CLI). These tools communicate with the API Server to manage applications and resources.

The Worker Nodes are responsible for running application workloads. Each worker node contains:

- Pods – The smallest deployable units in Kubernetes that host one or more containers.
- Container Runtime (Docker) – Executes and manages containers.
- Kubelet – Ensures containers are running as expected.
- Kube-proxy – Handles networking and load balancing within the cluster.

By distributing applications across multiple worker nodes, Kubernetes ensures high availability, scalability, fault tolerance, and efficient resource utilization, making it a preferred platform for cloud-native application deployment.

Kubernetes architecture



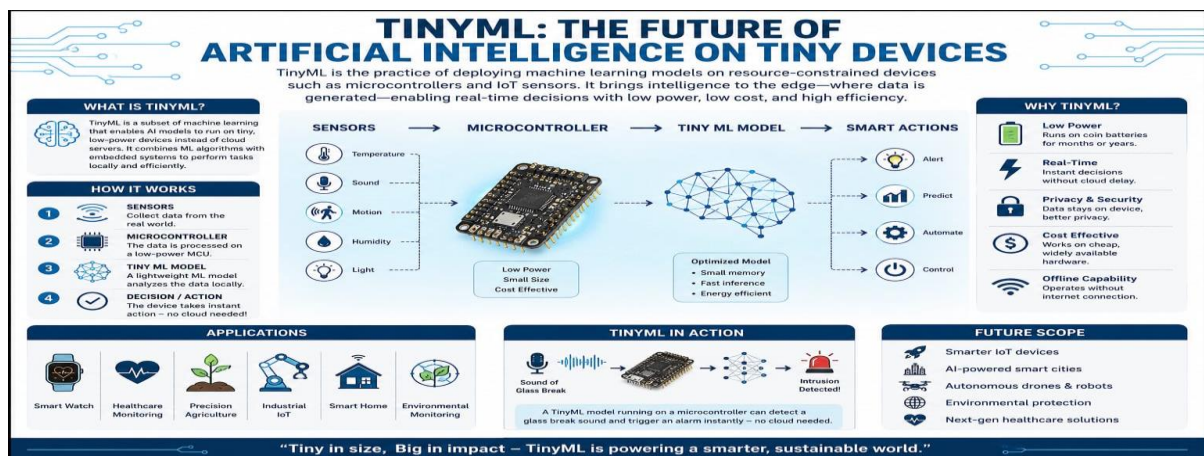
TinyML: The Future of Artificial Intelligence on Tiny Devices

G.Sri Harini

24A31A05BQ

TinyML has a wide range of applications. In healthcare, wearable devices can monitor heart rate and detect health issues in real time. In agriculture, smart sensors help farmers monitor soil and crop conditions. It is also used in smart homes for voice recognition, security systems, and energy management, as well as in industries for predictive maintenance and equipment monitoring.

The main advantages of TinyML include real-time decision-making, improved data privacy, energy efficiency, and low operating costs. However, developing accurate AI models for devices with limited memory and processing power remains a significant challenge.



As the Internet of Things (IoT) continues to expand, TinyML is expected to play a vital role in creating smarter, faster, and more efficient devices. It is opening new possibilities in robotics, healthcare, environmental monitoring, and industrial automation.

TinyML represents a major shift in artificial intelligence by moving computation closer to where data is generated. Its efficiency, speed, and low resource requirements make it a powerful technology for the future, enabling intelligent systems to function seamlessly in everyday environments.

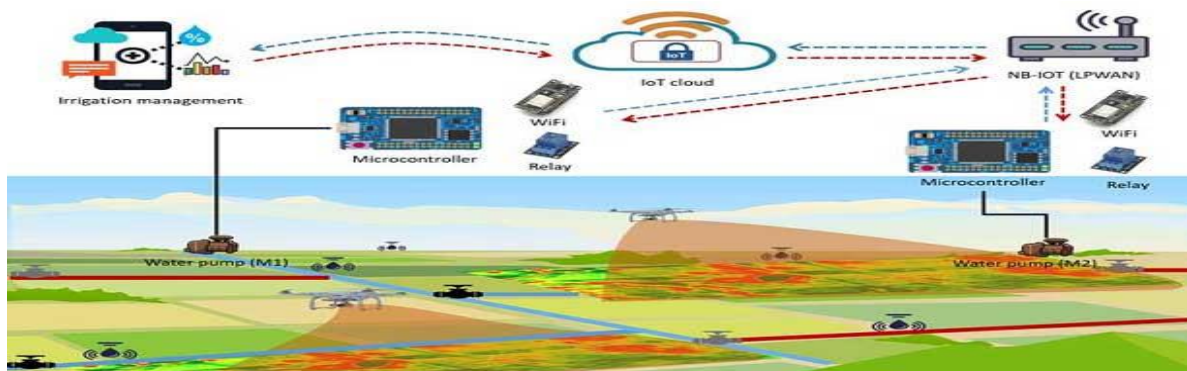
Smart Irrigation Systems Using IoT

Paladugu Venkata Siva Naga Tejaswini

24A31A05EP

Agriculture is one of the most important sectors of the economy, and efficient water management is essential for sustainable farming. Traditional irrigation methods often depend on manual operation or fixed watering schedules, which can lead to water wastage and uneven crop growth. The Internet of Things (IoT) provides a smart solution by automating the irrigation process and ensuring that crops receive the right amount of water at the right time.

A smart irrigation system uses IoT devices such as soil moisture sensors, temperature sensors, humidity sensors, and a microcontroller like Arduino or ESP32. These devices continuously monitor field conditions and collect real-time data. When the soil moisture level falls below a set limit, the controller automatically turns on the water pump. Once the required moisture level is reached, the pump is switched off, reducing unnecessary water consumption.



The collected data is sent to a cloud platform, where farmers can monitor their fields using a smartphone or computer. This remote monitoring feature allows farmers to check soil conditions, control irrigation, and receive alerts from anywhere. As a result, the system reduces manual effort, saves time, lowers labor costs, and improves crop health and productivity.

Smart irrigation systems are widely used in agricultural fields, greenhouses, gardens, and horticulture. They can also be integrated with advanced technologies such as Artificial Intelligence (AI), machine learning, and weather forecasting to predict crop water requirements and optimize irrigation schedules. These technologies help improve farming efficiency while conserving natural resources.

In conclusion, IoT-based smart irrigation is an innovative and sustainable solution for modern agriculture. It helps conserve water, reduces operational costs, improves crop yield, and supports precision farming.

The Future of Robotics: From Factories to Homes

Jakkampudi Ganga Sahithi

24A31A05EB

Robots were once confined to factory floors—powerful, repetitive machines designed to weld, assemble, and package at incredible speeds. Today, that image is rapidly changing. Robotics is entering a new era, one that extends far beyond industrial walls and into everyday human life.

In factories, robots are becoming smarter and more adaptable. Traditional industrial robots focused on speed and precision, but modern systems now use artificial intelligence, sensors, and vision technology to understand their environment. A major development is the rise of collaborative robots, or *cobots*, which work safely alongside humans. These machines take over physically demanding or hazardous tasks, allowing workers to focus on creativity, problem-solving, and supervision. The result is not job elimination, but job transformation.



As robotics advances, it naturally expands into other sectors. Warehouses use autonomous robots to manage inventory, hospitals rely on robotic assistance for surgeries and logistics, and agriculture benefits from robotic harvesting and monitoring. These real-world applications act as stepping stones, preparing robots for more complex and unpredictable environments—like our homes.

Home robotics is where the future becomes truly personal. Today's cleaning robots are only the beginning. Tomorrow's home robots may help with cooking, provide security, assist children with learning, or care for elderly family members.

With voice interaction, personalization, and learning capabilities, these robots will adapt to individual lifestyles rather than follow rigid instructions. For aging societies, robotic helpers could support independence while easing pressure on healthcare systems. However, this future also brings challenges. Concerns about privacy, safety, job displacement, and ethical use must be addressed responsibly.

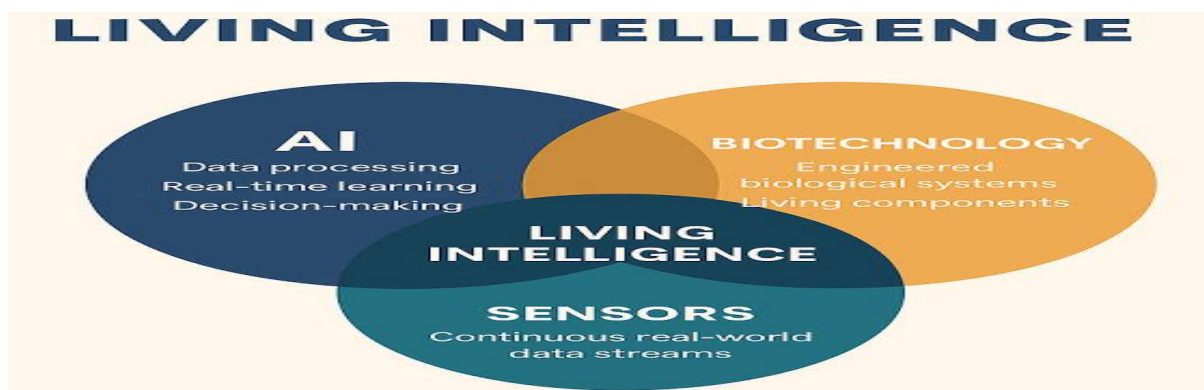
LIVING INTELLIGENCE: THE CONVERGENCE OF AI, SENSORS, AND BIOTECHNOLOGY

Siddana Reetya Sujitha
24A31A05EU

Technology is entering a new era where intelligence is no longer limited to computers or smartphones. **Living Intelligence** is an emerging concept that combines **Artificial Intelligence (AI)**, **smart sensors**, and **biotechnology** to create systems that can learn, adapt, and respond to real-world conditions. This integration is making technology smarter, more connected, and capable of solving complex challenges.

Living Intelligence uses data from wearable devices, medical equipment, and environmental sensors, which is analyzed by AI to identify patterns and support better decision-making. By incorporating biological data, these systems provide more personalized and efficient solutions for individuals and organizations.

One of its most promising applications is in **healthcare**. Smart wearables can continuously monitor vital signs such as heart rate and blood oxygen levels, while AI helps detect health risks early and supports timely medical intervention. In agriculture, intelligent systems improve crop production by optimizing irrigation and monitoring soil conditions. Industries also use Living Intelligence to predict equipment failures, reduce energy consumption, and improve operational efficiency.



Despite its benefits, Living Intelligence presents important challenges. Protecting personal data, ensuring cybersecurity, and maintaining ethical AI practices are essential for building trust in these technologies. Responsible development will ensure that innovation benefits society while protecting individual privacy.

Living Intelligence represents the next phase of digital transformation. As AI, smart sensors, and biotechnology continue to evolve together, they will reshape healthcare, agriculture, manufacturing, and many other industries. By enabling systems to learn from their environment and respond intelligently, Living Intelligence is paving the way for a smarter, healthier, and more sustainable future.

Artificial Intelligence as the Backbone of Modern Technology in 2026

T.Rupasri

24A31A05CQ

Artificial Intelligence (AI) has emerged as the backbone of modern technology in 2026, playing a crucial role in transforming nearly every sector of human life.. AI refers to the ability of machines to simulate human intelligence, enabling them to learn, reason, and make decisions. Its integration into everyday technology has made systems smarter, faster, and more responsive.



Several important trends are shaping the future of AI. One major trend is the development of autonomous or “agentic” AI systems that can perform tasks independently without constant human input. Another trend is AI-based software development, where AI helps in writing and testing code, making development faster and simpler. AI is also playing a major role in cybersecurity by detecting threats and preventing cyberattacks in real time. The impact of AI can be seen across many industries.

In healthcare, AI helps doctors diagnose diseases more accurately and provide personalized treatments. AI-based tools support students with customized learning experiences. Businesses use AI for automation and better decision-making, while the transportation sector is moving towards self-driving vehicles and smart traffic systems. AI also plays a significant role in advanced technologies such as self-driving vehicles, smart cities, and the Internet of Things (IoT).

These systems rely on AI to process data and make real-time decisions, improving safety, connectivity, and sustainability. For instance, AI helps manage traffic flow, energy usage, and public services in smart cities. In conclusion, Artificial Intelligence is transforming the world at a rapid pace. AI will play an even bigger role in shaping the future, making life easier while also creating new opportunities and challenges

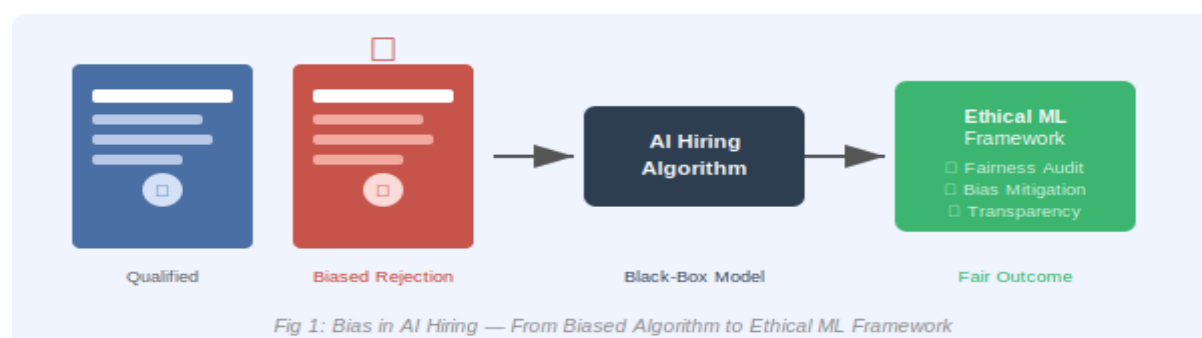
Reducing Bias in AI Hiring Systems using Ethical Machine Learning Frameworks

Gyaneswar Kondra

24A31A05DD

As organizations increasingly delegate recruitment decisions to automated systems, artificial intelligence has reshaped the landscape of talent acquisition. Resume screening algorithms, predictive scoring models, and natural language processing tools now filter millions of candidates before a single human eye reviews an application. Yet beneath this efficiency lies a critical vulnerability: ***Can a system trained on historically biased hiring data ever produce equitable outcomes?*** This question drives the growing field of ethical machine learning in HR technology.

The roots of AI hiring bias run deep. When training datasets reflect decades of underrepresentation — fewer women in technical roles, fewer minorities in leadership positions — the model learns to replicate those patterns as if they were meritocratic truths. Amazon's now-infamous internal recruiting tool, scrapped in 2018, systematically down-ranked resumes containing the word "women's," having inferred from historical data that male candidates were preferred. This was not a programming error but a statistical consequence of uncritical training. Proxy variables — zip code, university prestige, names — can encode race, class, and gender without ever invoking those protected attributes explicitly, slipping discrimination through the back door of seemingly neutral data.



Ethical machine learning frameworks address these vulnerabilities through a combination of pre-processing, in-processing, and post-processing interventions. Pre-processing techniques such as reweighing and disparate impact remover adjust training data to reduce embedded skew before a model ever sees it. In-processing methods, including adversarial debiasing, add a fairness constraint directly to the optimization objective — penalizing the model when it correlates predictions with protected attributes. Post-processing approaches like equalized odds calibration recalibrate model outputs to achieve demographic parity across groups. Tools such as IBM's AI Fairness 360, Google's What-If Tool, and Microsoft's Fairlearn make these interventions accessible to practitioners who may not hold a PhD in algorithmic fairness.

Explainability is equally central to ethical deployment. A hiring algorithm that cannot articulate *why* a candidate was screened out offers no path to appeal, accountability, or correction. SHAP (SHapley Additive exPlanations) values can surface which resume features most influenced a rejection — revealing, for instance, whether employment gaps penalized caregivers disproportionately. LIME (Local Interpretable Model-agnostic Explanations) allows auditors to interrogate individual predictions without access to the full model architecture.

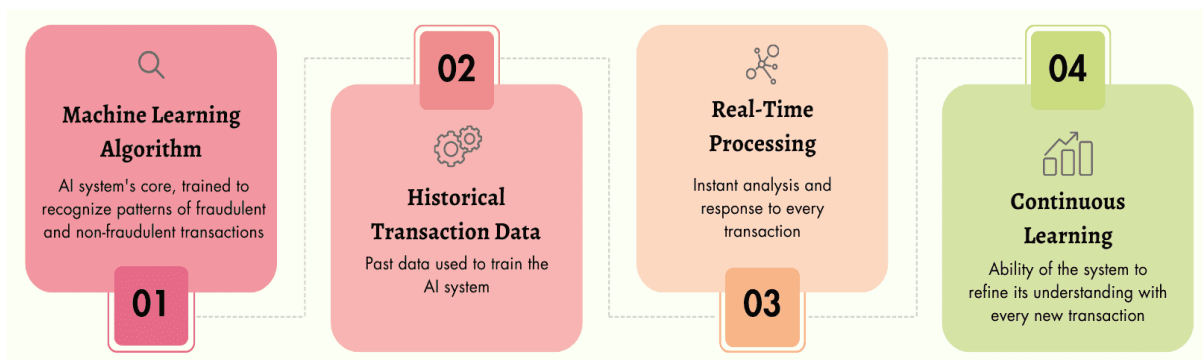
The Role of Explainable AI in Financial Fraud

Detection and Risk Assessment

Akarsh Vijjapu

24A31A05DR

In the high-stakes world of finance, artificial intelligence (AI) has become an essential tool against financial crime. It detects credit card fraud in milliseconds and assesses loan default risks. AI models now play a critical role in the global economy. However, as these systems become more powerful, a troubling question arises: Can we trust decisions made by systems we cannot fully explain? This is where Explainable AI (XAI) comes in. It focuses on clarifying algorithmic decision-making, especially when money, trust, and justice are involved.



Modern fraud detection systems depend on deep learning models and ensemble methods like gradient boosting (XGBoost, LightGBM). These models are great at identifying subtle patterns in transaction data that are often invisible to human analysts. However, they work as "black boxes." They generate predictions without any reasoning that regulators, investigators, or affected customers can review. In regulated industries, this lack of transparency is not just inconvenient; it can lead to compliance failures.

XAI tools help by turning unclear model outputs into understandable insights. SHAP (SHapley Additive exPlanations) values, for example, can show which transaction features, like unusual location, transaction speed, or merchant type, triggered a fraud alert. Similarly, LIME (Local Interpretable Model-agnostic Explanations) can clarify individual predictions by simplifying complex models. This transparency allows fraud analysts to quickly validate alerts, reducing false positives and the time spent on manual reviews.

Beyond improving efficiency, explainability has important implications for fairness and accountability. AI-driven credit risk models that lack clarity can reinforce systemic biases, unfairly penalizing applicants based on demographic factors hidden in the training data. XAI highlights these biases before they can cause harm. Regulators around the world are taking notice. The EU AI Act and the US Fair Credit Reporting Act are increasingly requiring institutions to explain negative AI decisions to those affected. Without explainability, financial institutions risk reputational damage and direct legal consequences.

Space Computing: Transforming the Future Beyond Earth

K.Vinmaye

24A31A05BY

Introduction

Space computing is the use of advanced computing systems, artificial intelligence (AI), cloud technologies, and data processing to support space exploration, satellite operations, and scientific research beyond Earth. Unlike traditional computing, space computing is designed to work in the harsh conditions of outer space, including extreme temperatures, radiation, and communication delays. It enables spacecraft, satellites, and space stations to process data independently, reducing the need for constant communication with Earth.

Key Points

- * Space computing involves computers and software designed specifically for use in space.
- * It supports satellites, spacecraft, space stations, and planetary rovers.
- * Artificial Intelligence (AI) enables autonomous decision-making during missions.

Space computing combines hardware and software that can survive the challenging environment of space. Since repairing equipment in space is difficult and expensive, these systems must be highly reliable and capable of operating for many years without failure.

One of the most important aspects of space computing is **onboard processing**. Modern satellites and spacecraft can analyze images, detect system problems, and make decisions without waiting for commands from Earth. This saves time, reduces communication delays, and improves mission efficiency.

Importance of Space Computing

Space computing is important because it enables faster, smarter, and more reliable space missions. It reduces communication delays, increases the autonomy of spacecraft, improves scientific discoveries, and enhances the efficiency of satellite operations. It also benefits life on Earth by improving weather prediction, navigation systems, internet connectivity, climate monitoring, and disaster response.

Conclusion

Space computing is revolutionizing the way humans explore and utilize space. By combining powerful computers, artificial intelligence, cloud computing, and advanced data processing, it allows spacecraft and satellites to operate more efficiently and independently.

The Autonomous Road: Self-Driving Cars

P Shyam

24A31A05FU

Autonomous Vehicles (AVs) represent one of the most profound paradigm shifts in modern transportation. By merging robotics, computer vision, and machine learning, self-driving cars move from traditional mechanical systems to intelligent, data-driven platforms capable of navigating dynamic urban environments without human intervention.

1. The Perception Stack: How Vehicles See

At the heart of self-driving technology is the perception engine, which mirrors human senses through a sophisticated suite of hardware sensors. No single sensor is sufficient; instead, vehicles rely on sensor fusion to combine data streams:

- **LiDAR (Light Detection and Ranging):** Fires millions of laser beams per second to build high-precision, 3D point-cloud maps of the environment, measuring exact distances to obstacles regardless of lighting conditions.
- **RADAR:** Utilizes radio waves to detect object distance and velocity, performing robustly in adverse weather conditions like heavy fog, rain, or snow where optical systems fail.
- **High-Resolution Cameras:** Provide the dense visual context necessary for semantic understanding, such as reading traffic signals, interpreting road signs, and identifying lane markings.

2. The SAE Levels of Driving Automation

THE SOCIETY OF AUTOMOTIVE ENGINEERS (SAE) defines six distinct levels of automation, tracking the shift of liability and control from human to software.			
LEVEL	CLASSIFICATION	OPERATIONAL DEFINITION & CAPABILITIES	
LEVEL 2 	PARTIAL AUTOMATION 	Advanced Driver Assistance Systems (ADAS). The vehicle controls steering and speed (e.g., adaptive cruise control), but the human driver must actively monitor the environment at all times.	 - Adaptive Cruise Control - Lane Keeping Assist - Human driver must stay engaged
LEVEL 3 	CONDITIONAL AUTOMATION 	The vehicle handles environmental monitoring and driving tasks under specific conditions (e.g., highway piloting). The human driver must be ready to intervene when requested.	 - Highway Pilot - Traffic & Environment Monitoring - Driver available to take over
LEVEL 4 	HIGH AUTOMATION 	The system manages all driving functions within a designated operational design domain (ODD), such as geofenced urban areas. No human interaction is required within these boundaries.	 - Geofenced Area - Full Self-Driving Within ODD - No human intervention required
 From driver support to driver replacement — SAE levels define the road to full automation.			 Human Driver  Automated System

3. Critical Technical and Ethical Challenges

Transitioning from Level 4 to true Level 5 (ubiquitous automation) involves solving deep systemic challenges. Edge cases—rare, unpredictable road scenarios like construction anomalies or extreme weather—stretch the limits of machine learning models.

Quantum Simulation for Drug Discovery

N.Sitadevi

24A31A05CJ

The process of discovering new medicines is both time-consuming and expensive, often taking more than a decade before a drug reaches patients. Scientists must understand how drug molecules interact with proteins and cells, a task that involves highly complex calculations. Traditional computers have helped accelerate this process, but they are often unable to accurately simulate the behavior of large molecules. This is where **quantum simulation** is expected to make a significant impact.

Quantum simulation uses the power of **quantum computing** to model molecular structures and chemical reactions based on the principles of quantum mechanics. Unlike classical computers that use bits (0 or 1), quantum computers use **qubits**, which can exist in multiple states simultaneously. This enables quantum computers to perform complex calculations much faster and more efficiently than conventional systems.

In drug discovery, quantum simulation helps researchers predict how molecules interact with disease-causing proteins, identify promising drug candidates, and optimize their chemical structures before laboratory testing. It can also simulate chemical reactions with greater precision, reducing the need for costly experiments and shortening the time required to develop new medicines. As a result, pharmaceutical companies can potentially discover safer and more effective drugs at a lower cost.

Despite its enormous potential, quantum simulation is still in its early stages. Current quantum computers face challenges such as limited qubits, computational errors caused by quantum noise, and high development costs.

In conclusion, quantum simulation has the potential to revolutionize drug discovery by enabling accurate molecular modeling, accelerating pharmaceutical research, and reducing development costs. As quantum technology continues to advance, it is expected to play a vital role in creating innovative treatments and improving healthcare worldwide.

Women in Technology

V.Dharani
24A31A05JV

Breaking Barriers • Building the Future • Inspiring Innovation

Women in Technology: Changing the World One Innovation at a Time

Technology has changed the way we live. Women have played a role in making this happen. From the computer programs to the latest developments in Artificial Intelligence, cybersecurity, robotics and space technology women have been driving innovation. They have done this even though they have faced obstacles in the past. Their work shows that talent, creativity and leadership are not limited to any one gender.

Women are making contributions in many areas including:



Artificial Intelligence



Cyber security



Cloud Computing



Emerging Technologies

Challenges Women Still Face

Even though progress has been made women in technology still face challenges:

Gender stereotypes, Unequal representation in leadership, Pay gap, Limited mentorship opportunities

Work-life balance, Bias in hiring and promotion.

To drive future innovation it is essential to create workplaces where everyone has an equal opportunity to succeed.

How to Encourage Women in Technology

Here are some ways to encourage more women to pursue careers in technology:



Promote STEM education from a young age



Provide scholarships and internships



Support women-led startups

Career Opportunities for Women:

Software Engineer, Artificial Intelligence/Machine Learning Engineer, Full Stack Developer and so on.

Conclusion:

Women have transformed technology from its beginning. Continue to shape its future. Their achievements show that innovation thrives when talent is recognized without barriers. By promoting opportunities encouraging girls to pursue STEM education and fostering inclusive workplaces we can create a future where technology reflects the creativity and potential of everyone. Women in technology are changing the world one innovation at a time. Women in technology are making an impact. Women, in technology are the future.

STUDENT CLUB ACTIVITIES

Empowering students through innovation, leadership, communication, and social responsibility.

AR/VR Club



Hands-on learning in Augmented and Virtual Reality technologies.

Press Club



Promoting journalism, media skills, and campus communication

Toastmasters Club



Building confidence in public speaking and leadership.

Waste Management Club



Encouraging sustainability and environmental awareness.