Shivalik College
Dehradun, Uttarakhand

NAAC GRADE A+

TECHFRONT

Technical Magazine

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

JULY 2022- JUNE 2023

DEPARTMENT VISION, MISSION, PEOs & PSOs

VISION

To cultivate **engineers** with a worldwide employability, a strong entrepreneurial aptitude, a dedication to **research**, and a sense of **social responsibility**.

MISSION

M1. To create top IT engineers with industry-aligned education.

M2. To boost the technical skills of students as well as faculty.

M3. To inspire students to pursue higher education and launch entrepreneurial ventures.

M4. To provide exposure of latest tools and technologies in the area of Engineering and Technology.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO 1: Graduates will have the ability to be employed in industries, academia, the public sector, or work as entrepreneurs.

PEO 2: Graduates will apply tools, technologies, and research to provide innovative solutions.

PEO 3: Graduates will have capabilities in identifying, conceptualizing, designing, developing, and implementing logical solutions for real-life challenges.

PEO 4: Graduates will have good communication skills, leadership skills, ethical values, and time management.

DEPARTMENT PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO-01: Analyze and implement Web-based technology for developing projects as per social and Industry needs.

PSO-02: Ability to develop various applications using open-source software tools extensively.

ABOUT THE DEPARTMENT

The Computer Science & Engineering Department was established in the year 2008 and has graduated many qualified engineers, working at very well-known organizations in India and abroad. The Department currently offers Bachelor's Degree in Computer Engineering, Bachelor's Degree in Artificial Intelligence and Machine Learning (AIML) and Data Science. In addition to core courses, electives are provided in various Computer Science cutting-edge subjects that generate opportunities for absorption in frontier fields of Computing. Students are involved in diverse technical events and cognitive activities to explore their creativity as well as problem-solving skills. This accredited course fulfills the growing needs of the industry and would equip students with an in-depth understanding of the principles of Computer Science. The Computer Science and Engineering department at the Shivalik College possesses a unique center- the Shivalik Computation and Automation Society (SCAS). Also, it has collaboration with ICT Academy which provides real-life practical learning methodologies. A well-designed system to assess every student's performance. Value Added courses, Case Studies & Projects, Seminars, Student Development Programs, and Induction Programs delivered on cutting-edge technology impart hands-on experience and skill enhancement in students. Students are advised and assisted in their project work and Industry-relevant course material is provided.

MESSAGE BY
VICE CHAIRMAN

MR. AJAY KUMAR

It gives me immense pleasure to extend my warmest congratulations to the Department of Computer Science and Engineering on the release of its technical magazine. This magazine stands as a testament to the innovation, dedication, and relentless pursuit of excellence that define our students and faculty.

In today's fast-paced digital era, platforms like this magazine play a vital role in fostering a culture of creativity, critical thinking, and collaboration. I am delighted to see the magazine encompass diverse sections such as the Student Corner, Faculty Corner, Best Project Abstracts, as well as glimpses of Tech Fests and Hackathons. These highlights not only showcase the technical prowess and accomplishments of our department but also inspire the academic community to dream bigger and reach higher.

The featured student innovations and faculty contributions reflect our institution's commitment to academic excellence and industry relevance. Such initiatives are instrumental in preparing our young minds to become future leaders in technology and innovation.

I extend my heartfelt appreciation to the editorial team, faculty mentors, and all contributors who have made this magazine a reality. May this publication continue to serve as a beacon of knowledge, creativity, and inspiration for the entire Shivalik College community.

With best wishes for continued success and innovation.

DIRECTOR'S MESSAGE

PROF. (DR.) PRAHLAD SINGH

It is a matter of immense pride to witness the release of the Technical Magazine of the Computer Science and Engineering Department. This publication is a vibrant reflection of the department's academic excellence, technical innovation, and collaborative spirit.

Featuring diverse sections such as Student Corner, Faculty Corner, Best Project Abstracts, and glimpses of Tech Fests and Hackathons, the magazine beautifully captures the intellectual energy and creative endeavors of our students and faculty.

In today's rapidly evolving technological landscape, such initiatives play a vital role in encouraging critical thinking, innovation, and knowledge sharing. This magazine serves not only as a platform to showcase talent but also as a source of inspiration for all readers.

I commend the editorial team, contributors, and faculty mentors for their dedication and vision. May this magazine continue to grow as a beacon of learning and excellence.

MESSAGE BY HOD

DR. ASHUTOSH BHATT

It is with great pride and enthusiasm that I present to you the latest edition of the **Technical Magazine of the Department of Computer Science and Engineering.** This publication is not just a collection of articles and achievements—it is a reflection of our collective spirit, creativity, and commitment to academic and technological excellence.

The magazine captures the vibrant essence of our department through various segments such as the Student Corner, Faculty Corner, Best Project Abstracts, and glimpses of our Tech Fest and Hackathons. These sections showcase the intellectual curiosity, innovative thinking, and collaborative efforts that define our department.

In an era where technology evolves rapidly, it is essential that we continuously learn, share, and grow. This magazine serves as a platform for our students and faculty to express their ideas, demonstrate their skills, and celebrate their accomplishments. From insightful technical articles to award-winning project abstracts, this edition is a testament to the high standards and progressive mindset of our academic community.

I take this opportunity to thank all contributors—students, faculty members, and the editorial team—for their dedication and hard work in bringing this publication to life. Your efforts not only enrich the department but also motivate others to pursue excellence.

Let us continue to innovate, collaborate, and inspire. May this magazine ignite new ideas and foster a culture of learning that reaches far beyond the pages.

MESSAGE BY
EDITORIAL BOARD MEMBERS

We are delighted to present this edition of the **Technical Magazine of the Computer Science and Engineering Department**, a platform that brings together the creativity, innovation, and academic spirit of our department.

This magazine features a rich blend of content—Student Corner, Faculty Corner, Best Project Abstracts, and snapshots from Tech Fest and Hackathon events—each reflecting the vibrant and dynamic culture of CSE at Shivalik College of Engineering.

As editorial board members, it has been a rewarding journey curating the thoughts, ideas, and accomplishments of our students and faculty. We believe this magazine will not only inform but also inspire all readers to push the boundaries of knowledge and innovation.

We thank everyone who contributed and supported this effort. Let this magazine be a voice for ideas and a celebration of excellence.

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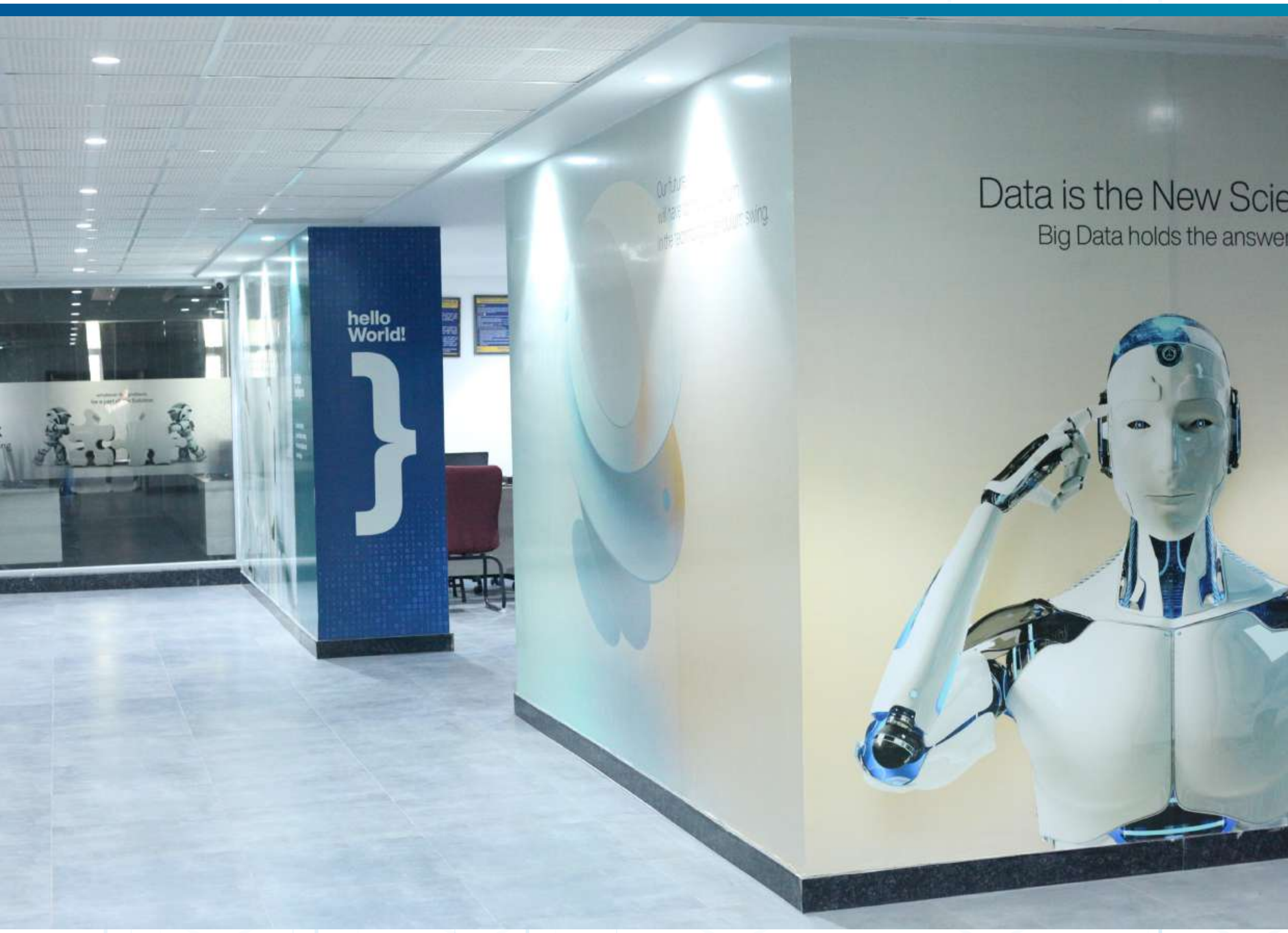
INDEX



FACULTY ARTICLES

SUSTAINABLE COMPUTING: PAVING THE WAY FOR A GREENER DIGITAL FUTURE

Dr. Ashutosh Bhatt
HOD-CSE

Introduction

As technology advances, the environmental impact of computing has become a growing concern. Sustainable Computing, also known as Green IT, focuses on designing, manufacturing, using, and disposing of computers and associated subsystems efficiently with minimal environmental impact. This article explores key concepts, challenges, and strategies for implementing Green IT in modern computing systems.

1. The Need for Sustainable Computing

The rapid growth of data centers, cloud computing, and electronic waste (e-waste) has significantly increased energy consumption and carbon emissions.

Key Statistics:

• (IEA, 2022).

• E-waste accounts for 53.6 million metric tons annually (Global E-waste Monitor 2023).

• A single Google search emits ~0.2g of CO_2 due to server energy use.

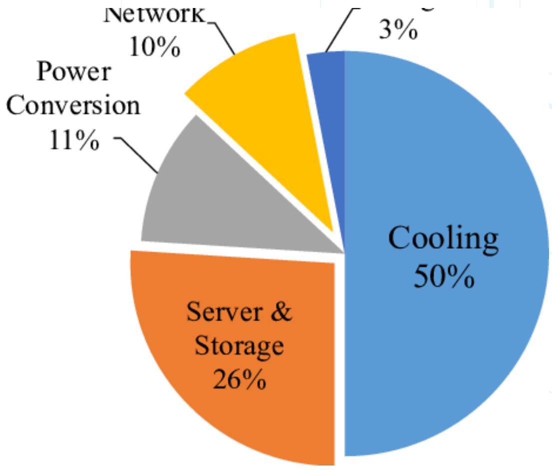


Figure 1: Energy consumption breakdown in a typical data center.

2. Key Strategies for Green IT

a) Energy-Efficient Hardware Design: The cornerstone of Green IT begins with hardware that minimizes energy consumption while maintaining performance.

b) Low-power processors: These processors, such as ARM-based chips, are designed to deliver significant energy savings compared to traditional high-power processors. Their architecture focuses on maximizing performance per watt, making them an ideal choice for mobile devices and energy-conscious data centers.

c) Solid-State Drives (SSDs): SSDs consume much less power than traditional Hard Disk Drives (HDDs). They also generate less heat, reducing the need for additional cooling infrastructure, thus contributing to an overall greener computing environment.

d) Dynamic Voltage and Frequency Scaling (DVFS): DVFS technology dynamically adjusts the voltage and frequency of a processor based on current workload demands. By scaling down power usage during low-demand periods and ramping up when needed, DVFS ensures optimal energy efficiency across a system's operation.

3. Virtualization & Cloud Optimization;

By leveraging virtualization and optimizing cloud computing practices, organizations can achieve substantial reductions in their environmental footprint.

a) Server virtualization: Virtualization allows multiple virtual servers to run on a single physical machine. This consolidation reduces the need for numerous physical servers, cutting down on energy usage and cooling requirements while improving resource utilization.

b) Renewable energy-powered data centers: Companies like Google and Apple are leading the way by powering their data centers with renewable energy sources such as solar and wind power. This transition not only reduces carbon emissions but also sets a benchmark for sustainable IT infrastructure.

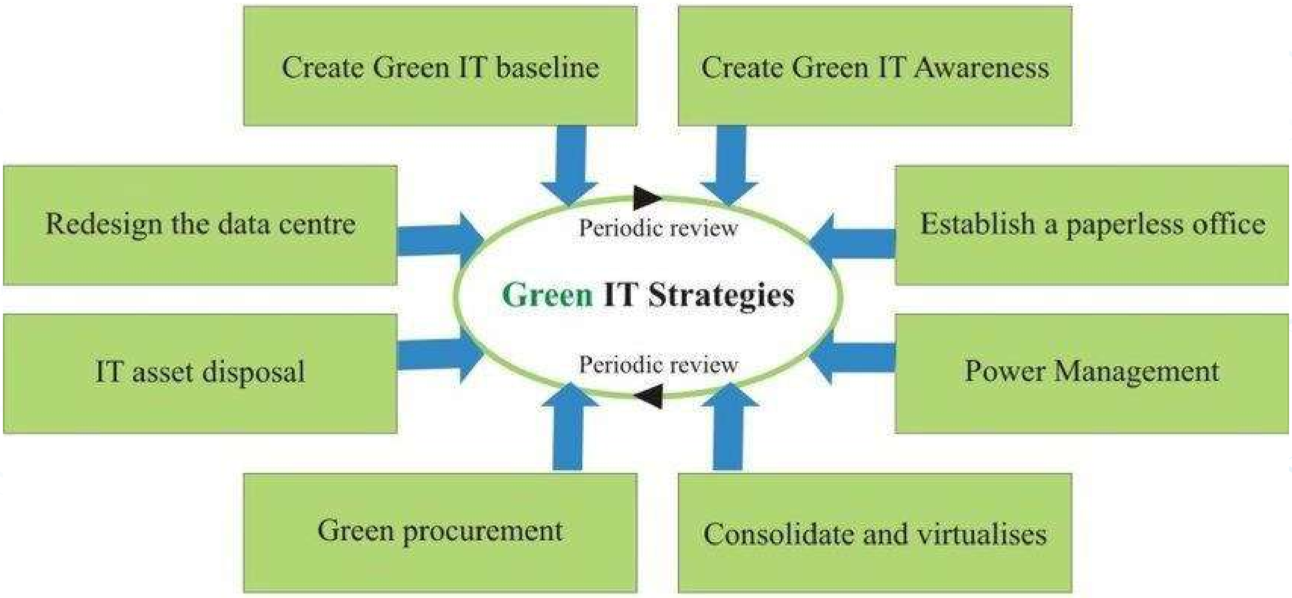


Figure 2: Key strategies for implementing Green IT.

4. Sustainable Software Development;

Software plays a critical role in the sustainability of IT systems. Green software development practices aim to reduce energy consumption and optimize performance.

a) Efficient algorithms: Developing software with optimized, energy-efficient algorithms can significantly reduce the computational overhead required to perform tasks. This translates to less energy consumption at the hardware level.

b) Edge computing: By processing data closer to the source (e.g., at the edge of a network), edge computing reduces the amount of data that needs to be transmitted over long distances to centralized data centers. This approach cuts down on the energy required for data transmission and can lead to more responsive, energy-efficient applications.

5. Challenges & Future Trends

a) Challenges

- High initial costs for renewable energy infrastructure.
- Lack of standardized regulations for e-waste recycling.
- Growing demand for AI & blockchain increases energy needs.

b) Future Trends

- Quantum Computing (potential for ultra-low-energy computations).
- Biodegradable Electronics (reducing e-waste).
- Carbon-Aware Computing (scheduling tasks during low-carbon energy availability).

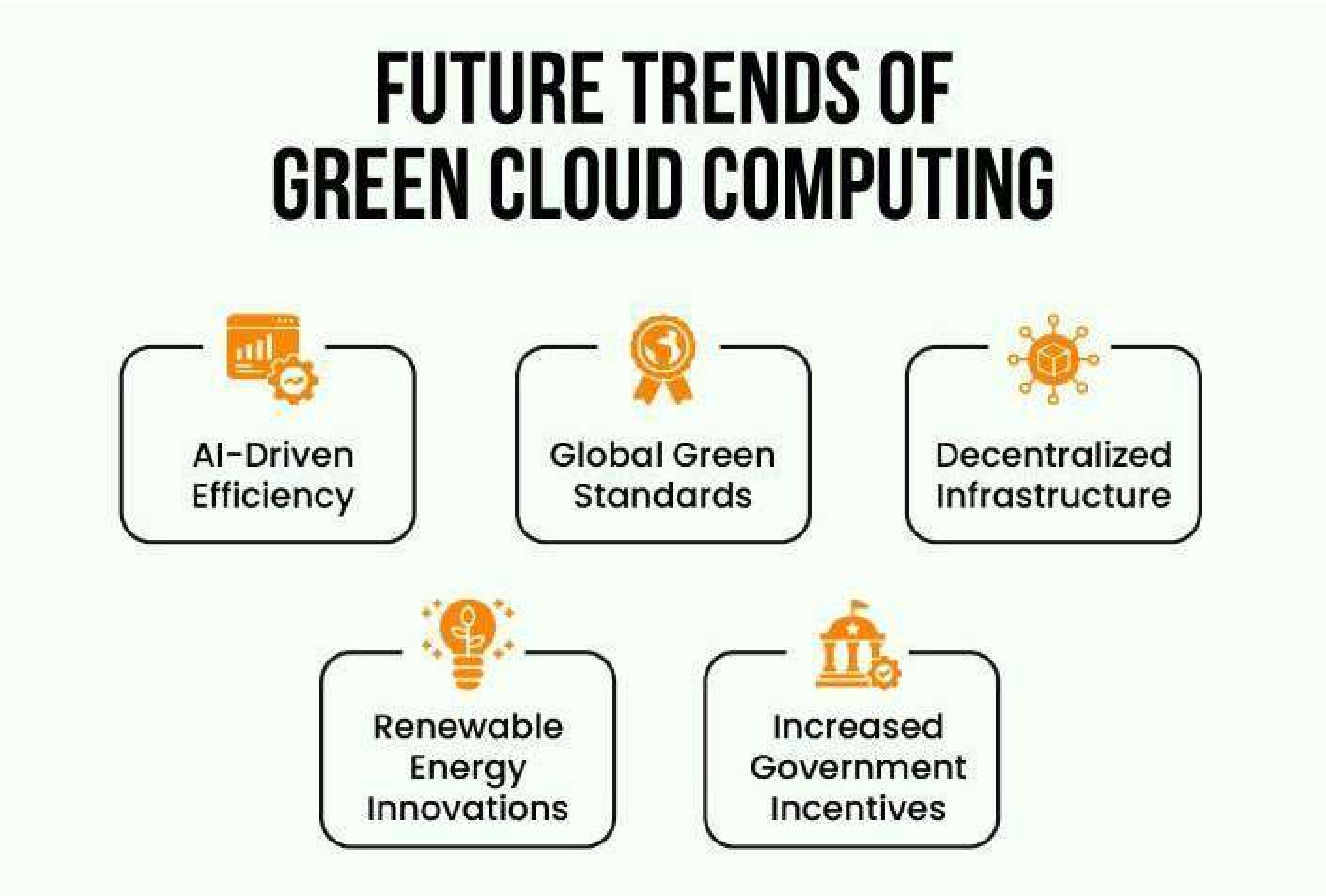


Figure 2: Key strategies for implementing Green IT.

6. Conclusion

Sustainable Computing is no longer optional—it's a necessity. By adopting energy-efficient hardware, optimizing software, and leveraging renewable energy, we can significantly reduce the environmental footprint of technology. The future of Green IT lies in innovation, policy-making, and collective responsibility.

FOG AND EDGE COMPUTING: BRIDGING THE GAP BETWEEN CLOUD AND DEVICES

Mr. Glen Bennet Hermon
Assistant Professor-CSE

1. Introduction

The rapid growth of the Internet of Things (IoT) has led to a massive increase in data generation at the network's edge—closer to where users and devices operate. Traditional cloud computing, which processes and stores data in centralized data centers, struggles to meet the demands of low latency, real-time analytics, and bandwidth efficiency for these applications. This is where Fog Computing and Edge Computing come into play. These paradigms aim to bring data processing closer to the source of data, improving performance and reducing the load on the cloud.

2. Fog Computing

Fog computing, often referred to as "fogging," is an extension of cloud computing that brings computation, storage, and networking services closer to end-users and devices. Developed by Cisco, fog computing leverages intermediate nodes (fog nodes) such as gateways, routers, or switches to process data locally or regionally.

Key Features:

- **Decentralized Architecture:** Processing occurs at multiple levels—between the cloud and the edge devices—offloading tasks from centralized data centers.
- **Reduced Latency:** Data is processed closer to the source, leading to faster response times for time-sensitive applications.
- **Improved Bandwidth Efficiency:** By processing and filtering data locally, only relevant data is sent to the cloud, reducing network congestion.
- **Enhanced Security:** Sensitive data can be processed locally, minimizing exposure to external threats.

Use Cases:

- **Smart Cities:** Traffic light control, pollution monitoring, and public safety systems. Developers push their code to a version control system like Git.
- **Healthcare:** Remote patient monitoring and real-time alerts for medical emergencies.
- **Industrial IoT:** Predictive maintenance and machine automation.

3. Edge Computing

Edge computing focuses on executing computation directly at or near the data source— on edge devices themselves or on nearby edge servers. Unlike fog computing, which involves multiple intermediary nodes, edge computing pushes processing capabilities right to the device level.

Key Features:

- **Device-Level Processing:** Data is processed on the device itself (like sensors, smartphones, or embedded systems) or on dedicated edge servers close to the devices.
- **Real-Time Analytics:** Ideal for ultra-low latency applications, such as augmented reality (AR) or autonomous vehicles.
- **Improved Reliability:** Localized processing ensures continued operation even if cloud connectivity is lost.
- **Energy Efficiency:** Reduces the need for continuous high-bandwidth data transfers to the cloud.

Use Cases:

- **Autonomous Vehicles:** Onboard data analysis for obstacle detection and decision-making.
- **Smart Home Devices:** Voice assistants like Amazon Alexa process voice commands locally for faster responses.
- **Retail:** Real-time in-store analytics and personalized customer experiences.

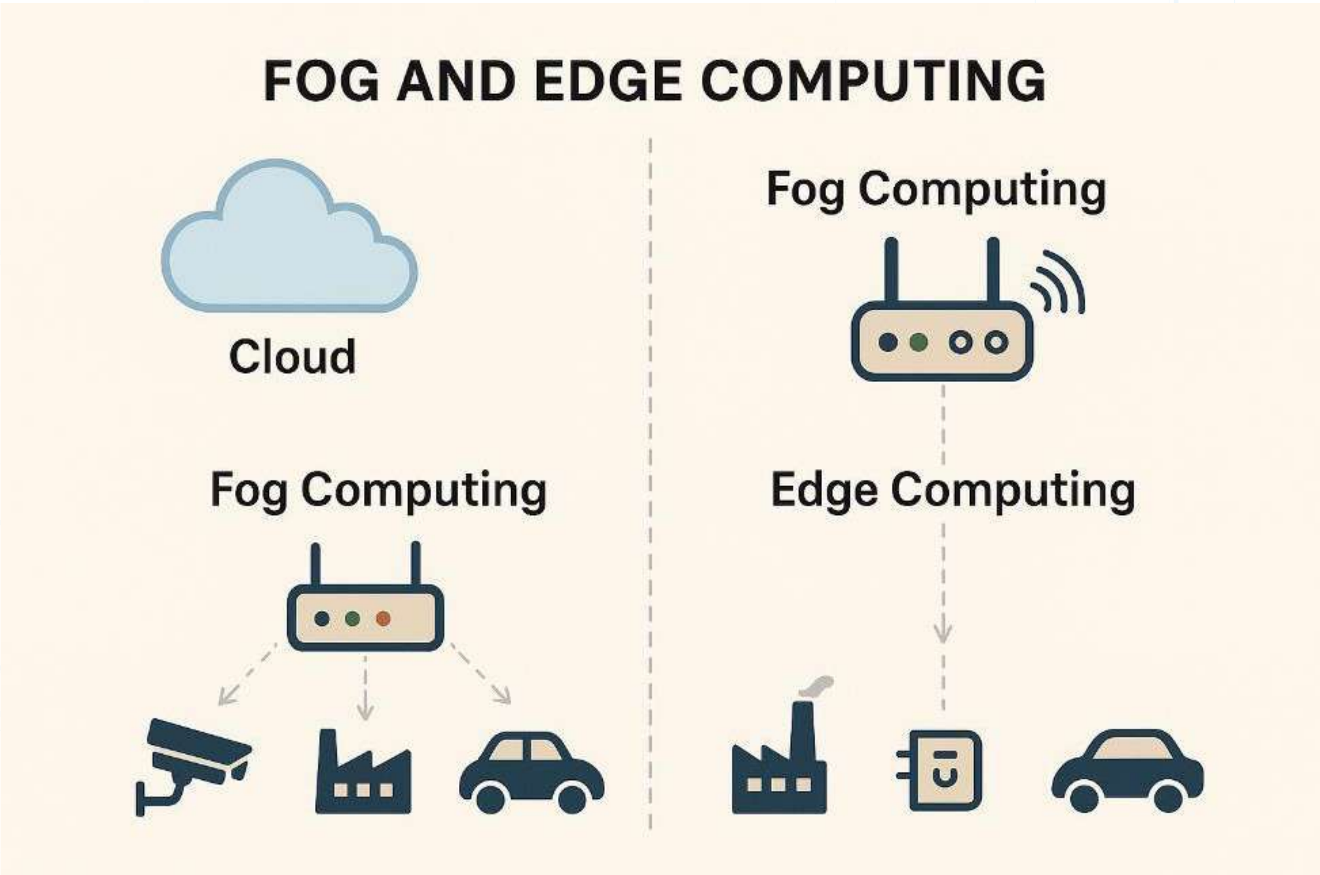


Figure : Fog and Edge Computing

4. Key Differences between Fog and Edge Computing

Aspect	Fog Computing	Edge Computing
Location of Processing	Intermediate network devices (gateways, routers)	Directly on end devices or edge servers
Architecture	Hierarchical, with multiple nodes	Flat, with data processed at the edge
Latency	Low latency, but slightly higher than edge computing	Ultra-low latency
Use Cases	City-wide monitoring, industrial IoT	Real-time control, AR/VR, autonomous vehicles

5. Benefits and Challenges Benefits:

- **Reduced Latency:** Enables real-time applications by processing data close to the source.
- **Bandwidth Optimization:** Local processing minimizes data transfers to the cloud.
- **Enhanced Security:** Local data processing reduces exposure of sensitive data.
- **Scalability:** Both paradigms support growing IoT ecosystems.

Challenges:

- **Management Complexity:** Orchestrating devices and processing across many nodes can be difficult.
- **Standardization:** Lack of universal standards can create interoperability issues.
- **Security Risks:** Edge devices can be more vulnerable to physical tampering and cyberattacks.

6. Conclusion

Fog and Edge Computing have emerged as essential paradigms to address the demands of modern applications that require low latency, real-time analytics, and efficient use of network resources. While both aim to bring processing closer to data sources, fog computing emphasizes intermediate network layers, whereas edge computing focuses on the device level. As IoT continues to grow, these technologies will play a critical role in shaping the future of connected systems, making them faster, more reliable, and more secure.

RECENT TRENDS IN EXPLAINABLE AI

Mr. Sartaj Khan
Assistant Professor- CSE

Artificial Intelligence (AI) plays a major role in various domains, including healthcare, finance, and security. However, as AI models become increasingly complex, their decision-making processes often turn opaque, leading to a lack of transparency and trust among end users. Explainable AI (XAI) addresses these concerns by elucidating how machine learning models arrive at their decisions. XAI offers two primary insights: first, it helps naïve human users understand how models make decisions, and second, it clarifies the influence of input features on the output variables.

For example, in the diagnosis of COVID-19 in patients, XAI can highlight which symptoms contributed most to the model's diagnosis. In image classification, XAI can explain why an image was classified as a cat, by emphasizing the specific pixels that influenced the decision. Similarly, in text classification with Support Vector Machines (SVM), an email may be labeled as spam or not spam based on hundreds of features (words, metadata), but without feature importance analysis, the decision-making process is hard to understand. Thus, XAI emphasizes the need for transparency, interpretability, and trustworthiness.

1. Types of Explanations

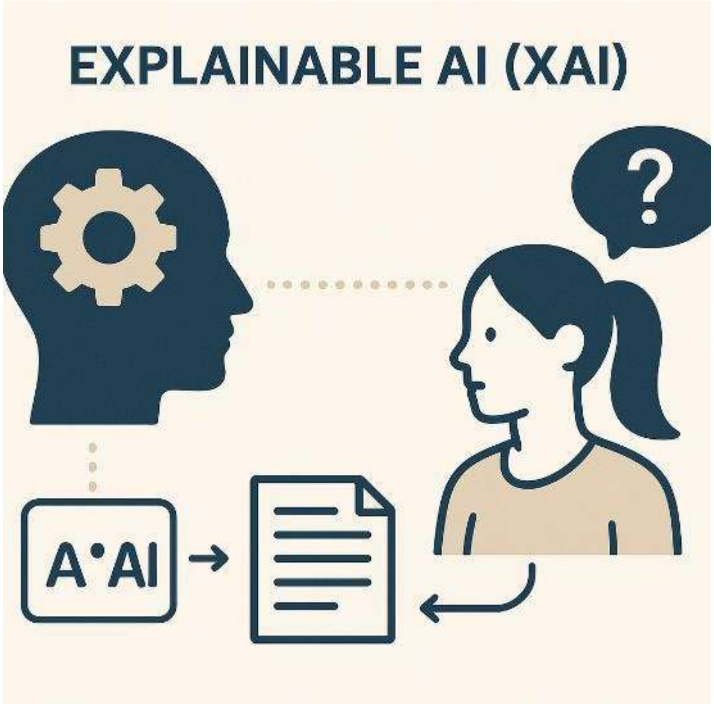
Local Explanations:

Local explanations focus on interpreting the rationale behind a single prediction for a specific input. For instance, in a medical diagnosis model, a local explanation would reveal why a particular patient was diagnosed with a certain disease. Local explanations help end-users—such as doctors, financial analysts, or security officers—understand the reasoning behind individual predictions, fostering trust in AI systems. They are crucial in scenarios where decision accountability is paramount, such as credit scoring or criminal justice.

Global Explanations:

In contrast, global explanations aim to provide an overall understanding of how a machine learning model works across the entire dataset. Rather than focusing on a single prediction, global explanations help users grasp the broader patterns and relationships the model has learned. This holistic understanding is essential for data scientists and developers who want to ensure that the model aligns with domain knowledge and does not incorporate unwanted biases. For example, global explanation might reveal that age or income level are the most significant factors in a loan approval model.

2. Types of XAI



Interpretable XAI:

Interpretable XAI focuses on creating models that are inherently understandable to humans. These models, such as decision trees, linear regression, and logistic regression, offer a direct and intuitive interpretation of how input features lead to output predictions. Interpretable XAI is particularly important in high-stakes applications where stakeholders demand clarity and accountability. For example, in a healthcare setting, clinicians prefer models that show straightforward rules for treatment decisions.

Transparent XAI:

Transparency is key to building trust between AI systems and their stakeholders. Transparent XAI ensures that every part of the AI model's decision-making process is visible and open to scrutiny. This involves not only revealing the inputs and outputs but also the logic and reasoning behind the predictions. Transparent AI helps organizations meet regulatory requirements and enhances ethical AI deployment. In financial services, for instance, transparent AI can help satisfy legal requirements around fairness and explainability.

Interactable XAI:

Interactable XAI allows end-users to engage with complex AI models, providing them with the tools to explore and influence the decision-making process. Rather than treating the AI as a "black box," interactable XAI fosters a two-way dialogue between humans and AI systems. This might involve interactive visualizations, sliders to adjust input parameters, or what-if scenarios to see how changes in data affect outcomes. For example, in a creative application like AI-generated artwork or event planning, users can guide the AI's choices to ensure the output aligns with their preferences or cultural context. Interactable XAI empowers stakeholders to co-create solutions and tailor AI outputs to real-world needs.

3. Methods of XAI

XAI can be implemented through various methods, with two widely used approaches:

SHAP (Shapley Additive Explanations): Based on cooperative game theory, SHAP assigns contribution values to each feature in a prediction. It provides mathematically sound explanations of individual variable impacts on the model's output. Example: In fraud detection, SHAP can reveal which transaction attributes (e.g., location, time, amount) influenced the AI model's decision.

LIME (Local Interpretable Model-Agnostic Explanations): LIME creates simplified approximations of complex models by fitting a local, interpretable model (like linear regression) around specific predictions. It helps users understand how minor changes in input data affect predictions. Example: In an AI-driven recruitment system, LIME can explain why a particular candidate was ranked higher.

4. Trends in XAI

Recent trends in XAI include:

- Regulatory Push for Transparency:

  Governments worldwide are enforcing stricter AI transparency regulations to ensure responsible AI use.

- Interpretable Deep Learning:

  Research into explainable neural networks is advancing, aiming to improve interpretability without sacrificing accuracy.

- Integration with MLOps:

  Companies are embedding XAI into Machine Learning Operations (MLOps) to continuously monitor fairness, accuracy, and accountability in AI systems.

- Human-AI Collaboration:

  AI systems are evolving to provide explanations in user-friendly formats, enhancing decision-making for stakeholders and promoting collaborative AI-human partnerships.

- Advancements in Natural Language Processing (NLP):

  AI models like ChatGPT and BERT are being optimized to deliver clearer explanations of their outputs, improving user experience and trust.

5. Conclusion

Explainable AI is a crucial area of research and practice that tackles the challenges of understanding and trusting complex AI models. By providing both local and global explanations, and through various forms of interpretability, transparency, and interactivity, XAI enhances trust, fairness, and accountability in AI applications. The growing focus on regulatory compliance, user-friendly explanations, and interpretability in deep learning underscores XAI’s critical role in modern AI deployments. As AI becomes increasingly integrated into our daily lives, XAI will continue to shape the responsible and ethical use of these powerful technologies.

GENERATIVE AI LIKE CHATGPT

Mr. Shiv Kumar
Assistant Professor-CSE

The audience of people who are obsessively online has gone crazy about ChatGPT, a chatbot developed by OpenAI. It has been applied to the writing of sonnets, essays, and even computer code, generally with a comment along the lines of "Wow, this is fantastic." It is the most recent and well- known instance of generative AI, the same kind of model that enables web platforms like Midjourney and DALL-E 2 to create graphics from prompts. Both proponents and opponents of broad language models like ChatGPT and others are already hailing these advancements as forces that will profoundly alter how we live and work, from how students complete their homework to who writes computer code. But the truth is more convoluted. Although generative AI models excel at a narrow range of tasks, they are not universally applicable technologies. For instance, ChatGPT can compose beautiful sonnets on tectonic plates but finds it difficult to write a modern definition of plate tectonics. Given that GPT-3, the huge language model it was trained on, finished collecting data in 2021, and that it has a tendency to be biassed, it also struggles to produce accurate code or comprehend the context of current events. Furthermore, despite the fact that many startups claim to be working on "generative AI," experts and venture capitalists claim that in some cases this is simply marketing as tiny businesses jump on the newest buzzword bandwagon. Writing form emails, penning an article on philosophy, or producing record covers are examples of more generic jobs where generative AI might excel. How compelling it may be might sometimes work against it.

What is generative AI?

AI is not a monolithic field. It encompasses many types of models and architectures whose common ground is imitating human intelligence. Historically, most models have focused on tasks such as pattern recognition to help make analyzing large amounts of data more efficient. For example, you could have an algorithm that monitors thousands of cameras and senses when a human is approaching one — cutting back on labor and saving money. (Congratulations, you've now made Ring doorbells possible!) It's also the reason AI can recognize an identify images of, say, a cat. Generative AI flips that on its head by shifting from analyzing existing data for information to using that data to learn how to write new text or create new images."The difference now with more generative AI, it's not so much about the interpretation and processing of information as the production of new content," said Micah Musser, a research analyst at Georgetown University's Center for Security and Emerging Technology. "And so that opens up the ways in which this technology can affect the jobs or the activities of people who weren't previously affected — including software engineers, writers and artists

STUDENT WRITE-UP

A GUIDE TO NON-FUNGIBLE TOKENS: UNDERSTANDING THE FUTURE OF DIGITAL OWNERSHIP

Jaya Pandey
B.Tech CSE II-Year

The use of Non-Fungible Tokens to own and trade digital assets has seen rapid growth in recent years. NFTs are built on blockchain technology and provide a secure, decentralized ledger of ownership and authenticity for each NFT. This makes NFTs impossible to change and easy to check, making sure that each token is a unique and valuable asset. Whether it is art, music, video, or gaming, NFTs allow creators and owners to establish ownership and provenance for their digital assets and sell, trade, or collect them in a new and exciting way. In this article, we will explore the concept of NFTs, how they work, and their potential impact on the digital world.

Figure 1: NFT

What are Non-Fungible Tokens (NFTs)?

A Non-Fungible Token, or NFT, is a unique digital asset that represents ownership of a specific item or piece of content, such as a piece of artwork, music, or video. Unlike traditional fungible assets, such as cryptocurrencies, each NFT is one-of-a-kind and cannot be replaced or exchanged on a one-to-one basis. An example of an NFT is a digital painting created by an artist. This painting can be sold to a collector as a unique and one-of-a-kind piece of art, just like a physical painting. The collector can then display and trade the digital painting just like they would with a physical painting. The NFT is then put on the blockchain, which makes a permanent, unchangeable record of all transactions and changes of ownership for that particular NFT.

How do NFTs work?

The idea of NFTs is made possible by blockchain technology, which keeps a safe and clear record of who owns each token and when it was made. This makes sure that each NFT is really different and can't be copied or replaced. Here's how it works:

1. Creation of the NFT: Creating a unique digital asset, such as a piece of artwork, music, or video.
2. Tokenization: "Tokenizing" the asset by converting it into a unique digital token on the blockchain. This token represents ownership of the specific asset and is stored in a digital wallet.
3. Issuance: The NFT is then issued on the blockchain, which creates a permanent and tamper- proof ledger of all transactions and transfers of ownership for the specific NFT.
4. Transactions: The NFT can then be bought, sold, and traded on various online marketplaces. When a transaction occurs, the ownership of the NFT is transferred from one digital wallet to another, and the transaction is recorded on the blockchain.
5. Verification: The ownership and authenticity of the NFT can be easily verified by anyone with access to the blockchain, providing transparency and trust in the ownership and provenance of the NFT.

Some characteristics of NFTs

- Uniqueness: NFTs represent ownership of a specific item that is unique and cannot be exchanged on a one-to-one basis like traditional fungible assets.
- Digital Ownership: NFTs provide a secure and verifiable way to establish digital ownership of a specific asset.
- Blockchain-based: NFTs are built on blockchain technology, granting a secure and decentralized list of all trades and transfers of possession for each NFT.
- Tamper-proof: The blockchain provides a tamper-proof record of ownership and authenticity for each NFT, ensuring that it cannot be duplicated or altered.
- Verifiable: The blockchain gives a clear and verifiable account of control and legitimacy for every NFT, making it straightforward to check the possession and origin of a particular asset.
- Monetization: NFTs allow originators and proprietors to gain income from their digital works and assets by offering, trading, and amassing extraordinary digital items.
- Scarcity: NFTs introduce a novel kind of scarceness for digital items, creating esteem for exclusive digital assets and permitting new prospects for makers and accumulators.

Impact of NFTs on the digital world

The rise of NFTs is revolutionizing the way we think about digital ownership and value. One of the key impacts of NFTs is the monetization of digital assets. NFTs provide a new way for artists, musicians, gamers, and other creatives to establish ownership and roots for their digital works, allowing them to monetize their creations in a way that was previously not possible. This has the potential to transform the art world, music industry, gaming industry, and more, as creators and owners are able to monetize their digital assets in new and exciting ways.

The impact of NFTs on the digital world is far-reaching and profound. They are providing a new level of trust and decentralization in the ownership and authenticity of digital assets, empowering artists and creatives, and creating new revenue streams and investment opportunities. As the technology continues to evolve and mature, the possibilities for NFTs are endless, and we can expect to see continued growth and adoption in the years to come.

NFTs represent a new era in the digital world, and their impact on the world is only just beginning. As technology continues to grow and change, it will be interesting to see how NFTs will affect the wider world and how they will shape the future of digital ownership and value.

LATEST TRENDS IN COMPUTER TECHNOLOGIES: BLOCKCHAIN

Karunakar Verma
B.Tech CSE-2nd Year Student

The rapid advancement in computer technology has drastically changed the way we live, work, and communicate. From smartphones to artificial intelligence, computer technology has revolutionized every aspect of our lives and continues to shape the future. With its endless possibilities and potential, computer technology is a constantly evolving field that brings new innovations and ideas every day. This article will explore the latest advancements in blockchain technology and its impact on our daily lives. Blockchain technology has been rapidly evolving since its creation, with new advancements and trends emerging on a regular basis. The following are some of the latest trends in the world of blockchain technology:

- Decentralized Finance (DeFi): Decentralized finance refers to financial systems that operate on blockchain technology and allow for peer-to-peer transactions without intermediaries. DeFi has been growing rapidly in recent years, with new platforms and applications emerging that offer a wide range of services such as lending, borrowing, and trading of digital assets.
- NFTs: Non-fungible tokens (NFTs) are unique, one-of-a-kind digital assets that are stored on a blockchain. NFTs have become popular in the art world, where they are used to verify the ownership and authenticity of digital artworks. In addition, NFTs are being used in other industries such as gaming, music, and real estate, to represent unique assets.
- Hybrid Blockchains: Hybrid blockchains are a combination of public and private blockchains that offer the best of both worlds. Public blockchains like Bitcoin and Ethereum are transparent, secure, and decentralized, but they can be slow and expensive. Private blockchains, on the other hand, offer faster and cheaper transactions, but they are typically centralized and lack the transparency and security of public blockchains. Hybrid blockchains provide a way to balance these trade-offs by leveraging the strengths of both public and private blockchains. In a hybrid blockchain, certain parts of the network are kept private, while others are made public. For example, a company might use a private blockchain to store sensitive data, while using a public blockchain to verify and track transactions. This allows the company to maintain control over its sensitive data while still benefiting from the security and transparency of a public blockchain. Hybrid blockchains are growing in popularity due to the increasing demand for enterprise-grade blockchain solutions that can handle large amounts of data and transactions. They are

particularly well- suited for use cases in finance, supply chain management, and other industries where the need for security and scalability is high.

- Interoperability: Interoperability refers to the ability of different blockchain systems to communicate and exchange data with each other. As more blockchain networks are being created, the need for interoperability is becoming increasingly important. This is because a lack of interoperability can limit the potential for blockchain-based applications and limit their scalability. Interoperability can be achieved through various means, including the use of APIs, sidechains, and cross-chain bridges. By allowing different blockchains to communicate with each other, interoperability opens new possibilities for creating decentralized applications and services that can reach a wider audience. For example, imagine a decentralized platform that allows users to make payments using different cryptocurrencies. To do this, the platform would need to be able to communicate with different blockchains to verify transactions and exchange data. This is only possible if the platform is interoperable with the different blockchains it interacts with.
- Security Token Offerings (STOs): Security token offerings (STOs) are a new form of fundraising that involves issuing security tokens that represent ownership in an underlying asset, such as real estate or stocks. STOs offer a number of benefits compared to traditional investment instruments, including increased security, transparency, and liquidity. In an STO, a company issues security tokens that are stored on a blockchain. These tokens represent ownership in the underlying asset and can be bought and sold just like stocks. Because they are stored on a blockchain, security tokens offer increased transparency and security compared to traditional investment instruments. This is because all transactions are recorded on the blockchain, making it easy to track and verify ownership. STOs also offer increased liquidity compared to traditional investments, as security tokens can be bought and sold on various exchanges and trading platforms. This makes it easier for investors to buy and sell their investments, increasing the overall liquidity of the market.

In conclusion, blockchain technology is rapidly evolving and these trends represent just a few of the many exciting developments in this field. As the technology continues to mature, it is likely that new trends will emerge, leading to even more innovative and impactful applications of Blockchain.

TRANSFER LEARNING: REUSING PRE-TRAINED MODELS FOR NEW TASKS

Hari Karmakar
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The rapid success of deep learning across domains such as computer vision and natural language processing can largely be attributed to the availability of large-scale datasets and powerful models. However, training these models from scratch is both computationally expensive and time-consuming. **Transfer Learning (TL)** is a paradigm that reuses knowledge from a source model trained on a broad dataset to improve learning efficiency and generalization on a new, often data-scarce, target task. This article discusses the foundational concepts of transfer learning, its key methodologies, popular tools, and practical considerations that help practitioners efficiently apply pre-trained models to new domains. Keywords: Transfer Learning, Pre-Trained Models, Deep Learning, Fine-Tuning, Feature Extraction. Modern AI systems often require large annotated datasets and substantial computational power. For most practical problems — especially those outside mainstream datasets — obtaining millions of labelled samples is infeasible. Transfer learning provides a practical alternative by leveraging rich feature representations learned on a large source dataset (e.g. ImageNet, Books Corpus), then adapting this knowledge to a new target task. This approach is particularly popular in computer vision, natural language processing (NLP), and speech recognition domains. Methodologies in Transfer Learning: Pre-Trained Model Selection. The correct architecture is crucial. Commonly adopted models include:

- Vision: ResNet50, Efficient Net, InceptionV3, MobileNetV2 — pre-trained on ImageNet.
- NLP: BERT, Roberta, Distil BERT — pre-trained on large textual corpora.

Feature Extraction vs. Fine-Tuning

- Feature Extraction: The pre-trained base model acts as a fixed feature encoder; only the top classifier layers are trained on the new task.
- Fine-Tuning: Some or all layers of the pre-trained network are unfrozen and trained on the target data, allowing fine-grained adaptation. Optimization Techniques: choosing hyperparameters like learning rate, batch size, and regularization is important. Techniques include: **Gradual Unfreezing:** Progressively unfreeze deeper layers one at a time. **Learning Rate Scheduling:** Cosine annealing or ReduceLROnPlateau can improve convergence. **Optimizers**: AdamW and SGD with momentum remain standard choices. **Tools and Implementations** Transfer learning is well-supported by: TensorFlow/Keras: TensorFlow. keras.applications for image models and TF Hub for pretrained language and audio embeddings.PyTorch: torch vision. models for CV and transformers by Hugging Face for NLP,Advanced tools like Hugging Face's Trainer or fast.ai's Learner allow rapid experimentation and

fine-tuning. Current Trends and Challenges. Domain Adaptation Research is moving towards domain adaptation and zero-shot transfer, allowing models to generalize across differing data distributions without explicit retraining. **Self-Supervised Pretraining.**

Traditional supervised training requires a vast amount of high-quality labelled data, which is often expensive and time-consuming to produce. Recent advances in **self-supervised** learning have overcome this dependency by learning rich feature representations from large amounts of unlabelled data. Techniques such as **SimCLR (Simple Contrastive Learning) and MAE (Masked Autoencoders)** utilize contrastive and reconstruction-based objectives, allowing models to discover useful patterns and semantic structures within the data itself. This approach greatly expands the scalability of pretraining and enables effective transfer learning even in domains where labelled data is scarce or non-existent. Moreover, self-supervised models often produce more robust and generalized feature embeddings, improving downstream accuracy across a diverse range of tasks such as image classification, object detection, and language understanding.4.5. **Model Compressions** deep learning models grow larger and more complex, deploying them on resource-constrained devices like mobile phones, IoT devices, or embedded hardware becomes a major challenge. **Model compression techniques** — including quantization, pruning, and knowledge distillation — help address this problem:

- **Quantization** reduces the numerical precision of model parameters (e.g. from 32-bit floating-point to 8-bit integers), shrinking model size and speeding up inference.
- **Pruning** eliminates redundant or insignificant connections and neurons without significant accuracy loss, producing lighter and faster models.
- **Knowledge Distillation** transfers knowledge from a large "teacher" model into a smaller, "student" model, creating a more efficient architecture that mimics the behaviour of its larger counterpart.

Such compressed models retain most of the performance of the original network but require substantially less memory, bandwidth, and computation. This enables AI-powered solutions to scale down to edge devices and real-time systems, making them more energy-efficient and responsive. **Conclusion Transfer learning** is a cornerstone methodology that allows practitioners to leverage the power of large, generic deep learning models and adapt them to new tasks with limited data and resources. Techniques like feature extraction, fine-tuning, self-supervised pretraining, and model compression collectively enhance the scalability, efficiency, and accessibility of AI. These advances not only democratize access to state-of-the-art deep learning tools but also drive innovation across industries — from healthcare and autonomous systems to personalized education and sustainable computing. As the field progresses, we can expect even more **robust, adaptable, and privacy-preserving transfer learning methods** to emerge. Techniques like federated learning will enhance privacy by enabling collaborative training without sharing raw data, while continual and meta-learning will improve adaptation to changing domains over time. Together, these trends will help further bridge the gap between research and deployment, empowering a diverse range of stakeholders — from large enterprises to small start-ups and even hobbyists — to incorporate advanced AI into practical, real-world applications.

AI IN SMART HOMES: THE RISE OF INTELLIGENT LIVING SPACES

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Smart home systems — powered by advances in Artificial Intelligence (AI), Internet of Things (IoT), and Edge Computing — have reshaped modern living. They leverage embedded sensors, real-time data analytics, predictive control, and privacy-preserving techniques to optimize comfort, safety, and energy use. This article explores the architecture, tools, methodology, and future research directions for AI-enabled smart home solutions. A practical case study on an AI-driven energy optimization system illustrates the practical benefits and deployment process. Keywords Smart Home, Internet of Things (IoT), Edge AI, Privacy-Preserving Learning, Automation, Energy Optimization, Introduction Smart home technologies allow residents to control devices, optimize energy consumption, and enhance home security seamlessly. Powered by AI algorithms, these systems can anticipate user needs, respond to voice commands, recognize occupants, and efficiently manage home appliances. Techniques such as computer vision for security, speech recognition for hands-free control, and predictive models for resource management play a central role in making these spaces truly intelligent, **Methodology Sensors and Data Collection**, Smart homes integrate various sensor nodes — cameras, motion detectors, thermostats, and smart meters — connected via protocols like **ZigBee, Z-Wave, or Matter**. Data streams are pre-processed locally using **edge devices** such as Raspberry Pi or NVIDIA Jetson Nano. AI Techniques

- **Computer Vision:** Implemented with pre-trained models like **YOLOv5** and MobileNetV2 to detect people, recognize faces, and detect anomalies.
- **Speech Recognition:** Powered by models like **Whisper** and **Wav2Vec2** for voice-controlled lighting, entertainment, and appliance control.
- **Time-Series Forecasting:** LSTM and **Prophet** models to predict energy usage, adjusting devices proactively for cost savings.
- **Reinforcement Learning:** Adaptive temperature and light control using reward-driven policies.

Cloud-Edge Architecture

Processing is split across **edge** (local, real-time decisions) and cloud (AWS IoT Core, Azure IoT Hub) to minimize bandwidth and maximize privacy. Serverless functions (e.g. **AWS Lambda**) trigger automation workflows like sending security alerts or adjusting power consumption.

Tools & Frameworks

- **TensorFlow/Keras** and **PyTorch** for training CV/NLP models.
- **Hugging Face Transformers** for fine-tuning language models.
- **MQTT** for lightweight device messaging.
- **Grafana & InfluxDB** for real-time monitoring dashboards.

Case Study: Energy Optimization with AI Problem Statement

A smart home faces fluctuating energy consumption due to varying occupancy and unpredictable weather. The goal is to reduce energy waste and utility bills without manual intervention.

Implementation

1. **Data Collection:** Sensors record temperature, light intensity, and energy consumption every 10 seconds.
2. **Modelling**: An LSTM model is trained to predict the next-hour energy demand.
3. **Control Logic:** A reinforcement learning agent adjusts heating/cooling schedules and appliance usage based on model forecasts.
4. **Deployment:** The model is deployed on a Jetson Nano at the edge for real-time control, with AWS Lambda handling predictive analytics in the cloud. **Results** This system achieved a **~18% reduction in energy usage** during peak periods while maintaining user comfort. Additionally, security cameras powered by MobileNetV2 flagged suspicious activity with a **96% detection accuracy.**

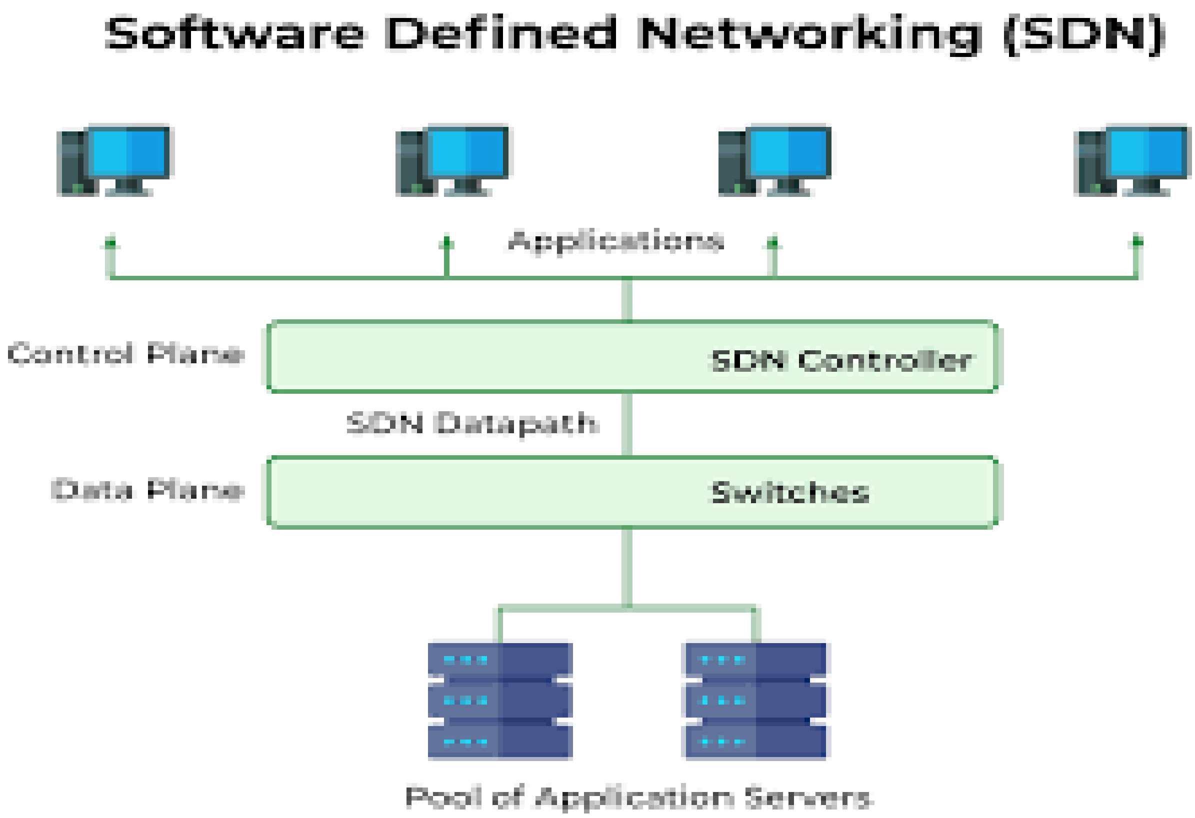
Discussion and Future Directions

While AI-enabled smart homes have already demonstrated substantial improvements in comfort, security, and energy management, several key challenges and research frontiers remain critical for further advancement. Privacy and Trust continue to be central concerns in these connected ecosystems. Smart home devices often rely on continuous data streams — including occupancy patterns, voice commands, and video feeds — creating substantial risks around data breaches and surveillance. Techniques like federated learning, where local devices collaboratively train a global model without sharing raw data, offer a promising path to address these concerns. Federated architectures, often coupled with homomorphic encryption or differential privacy, allow collaborative learning while mathematically ensuring that personal data cannot be reconstructed by third parties. This privacy-first approach aligns with regulatory frameworks like the GDPR and will help encourage greater user adoption and trust in these systems. Another significant challenge lies in scalability and interoperability. The fragmented landscape of smart home devices — spanning different protocols and ecosystems — requires robust standardization for seamless interoperability. The emergence of the Matter protocol, supported by industry leaders like Apple, Amazon, and Google, is a substantial step forward. By providing a unified application layer that works across different hardware platforms, Matter simplifies device pairing and control, reducing integration complexity and enabling a more diverse, competitive smart home ecosystem. On the deployment front, edge model optimization is critical for bringing powerful AI to resource-limited devices such as microcontrollers and embedded processors. Techniques like pruning, quantization, and knowledge distillation systematically reduce the number of parameters or numerical precision of large AI models. This allows state-of-the-art deep networks — originally trained on powerful servers — to run efficiently at the edge with low latency and minimal power consumption. The resulting on-device inference enables real-time response, preserves privacy by keeping data local, and enhances system resilience even when disconnected from the cloud. Looking ahead, emerging research into continual and lifelong learning will further enable smart home AI to evolve dynamically as user behaviours shift over months or years. Adaptive algorithms that detect and incorporate novel patterns — while avoiding catastrophic forgetting — will make these systems increasingly personalized and context-aware. Moreover, advances in explainable AI (e.g. LIME, SHAP) will help demystify automated decisions, allowing residents to understand why the smart thermostat decided to adjust temperature or how the security camera flagged an alert. This transparency is not only important for user comfort but also vital for safety-critical domains and legal compliance. In summary, the convergence of edge computing, deep learning, privacy-preserving collaboration, and explainable decision-making points toward a future where smart home ecosystems are truly autonomous, trustworthy, and sustainable. As these research directions mature, they will support new levels of intelligence and interoperability — seamlessly integrating into daily life, learning continuously from their environment, and contributing to more energy-efficient and resilient living spaces without compromising user control or privacy.

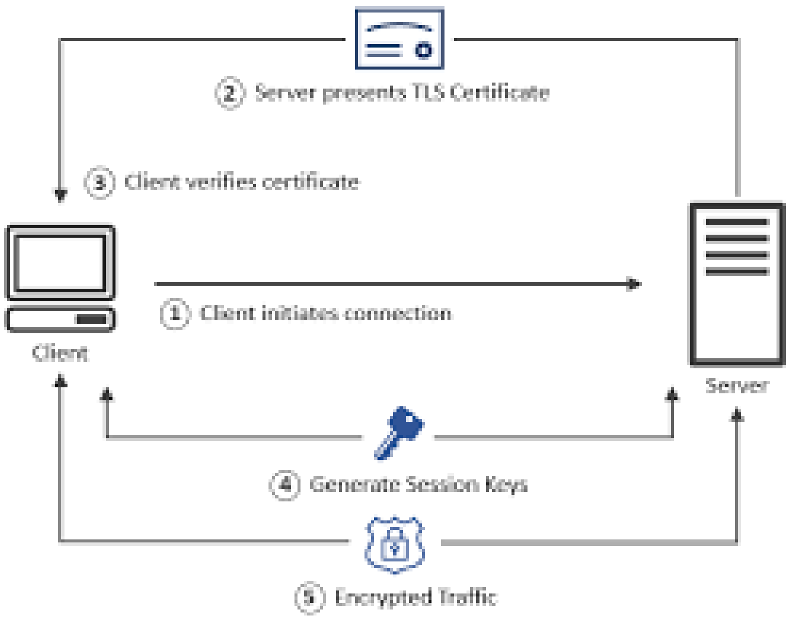
SOFTWARE-DEFINED NETWORKING (SDN): TRANSFORMING MODERN NETWORK ARCHITECTURES

Kritika Bisht
B.Tech II-Year

Modern computer networks have grown highly complex, making traditional hardware-centric architectures difficult to manage, scale, and adapt. Software-Defined Networking (SDN) addresses these challenges by separating the control plane from the data plane, allowing dynamic, programmable control of network behaviour through software. Unlike conventional networks, where devices like routers and switches make independent decisions, SDN centralizes network intelligence in a dedicated controller, while simple hardware devices focus on packet forwarding. This enables greater flexibility, easier policy enforcement, and rapid adaptation to evolving application requirements.



The architecture of SDN is typically divided into three logical layers. The application layer contains business or security applications—such as firewalls, load balancers, and traffic engineering tools—which leverage the SDN controller's global view of the network. Applications communicate their policies to the controller through northbound APIs using simple, high-level commands. The control layer is implemented as a software-based controller, often built using platforms like ONOS, Ryu, or Open Daylight, which handles all routing decisions and orchestrates network-wide policy enforcement. The controller programs the data plane through southbound protocols such as OpenFlow. Finally, the data plane consists of programmable switches and routers that simply execute flow-table rules pushed down by the controller and report back topology and statistics. The SDN process begins with network discovery, as the controller identifies all links and devices through messages such as LLDP. Once this topology is established, the controller communicates with each switch over a secure channel and populates its flow tables as new traffic arrives. When a packet reaches a switch and there is no matching entry, the switch forwards the packet header to the controller. The controller processes this "packet-in" event, consults its global view of the network, and replies with a "flow-mod" message that defines match criteria and corresponding forwarding actions. These updates allow the switch to handle future packets directly at wire speed without further consultation. Throughout this cycle, the controller continuously monitors the network and can dynamically reroute traffic if congestion or device failures occur, ensuring high availability and optimal performance.



Numerous tools and frameworks support SDN deployment. Minijet enables rapid prototyping and testing of SDN topologies on a single machine, allowing researchers and practitioners to explore ideas before full-scale deployment. Popular SDN controllers such as Ryu or ONOS come with rich APIs and modular design so that developers can add new features. On the southbound interface, OpenFlow has become the de facto standard, allowing the controller to precisely define packet-matching criteria and actions. Beyond traditional protocols, languages like P4 offer a more flexible model for defining packet-processing logic, which enables greater customization in hardware or software switches. In cloud and containerized environments, SDN integrates into orchestration platforms like Kubernetes via CNI plugins, providing automated control of networking policies across distributed workloads. As organizations embrace SDN, they must also plan for scalability and security. While the central controller simplifies network management, it also represents a critical control point that must be secured. Techniques like encrypted control sessions with TLS, role-based access control on the controller, and continuous auditing help mitigate risks.

Scalability is often addressed through distributed controller clusters with east–west interfaces allowing multiple controllers to share state and responsibilities. Performance optimization is equally important: controller algorithms must efficiently process control messages in parallel, and switches must support hardware acceleration with TCAMs and hierarchical tables for line-rate packet handling. Emerging security techniques such as micro-segmentation and dynamic access policies further enhance SDN resilience. Looking to the future, SDN will continue to evolve toward intent-based and AI-driven networking. Intent-based systems allow operators to declare high-level goals—for example, specifying that voice and video traffic must receive guaranteed bandwidth—while the SDN controller translates these goals into actionable device configurations. Meanwhile, integrating machine learning enables predictive optimization, allowing controllers to proactively reroute flows or scale capacity before congestion occurs. Lightweight SDN controllers will also extend these concepts to the edge, orchestrating micro-networks for 5G and IoT devices with ultra-low-latency requirements. Explainable AI will help make decisions more transparent and improve operator trust as these automated networks grow in complexity. In conclusion, Software-Defined Networking represents a profound shift in network design that simplifies management, enhances adaptability, and enables innovation across data centers, enterprise networks, and service-provider infrastructures. Its layered architecture decouples control logic from hardware, allowing dynamic flow setup and rapid policy changes across distributed devices. Continued research into scalability, intent-driven automation, and AI-driven control will help SDN scale to even more diverse and demanding scenarios. As a result, SDN will remain a cornerstone of future networks that are not only faster and more efficient, but also more secure, transparent, and easier to manage—driving progress toward smarter, more resilient, and user-centric communication networks.

FACE RECOGNITION ATTENDANCE SYSTEM

Nitish Kumar Singh, Irshad Ali, Bitu Kumar, Kundan Kumar Singh
Computer Science & Engineering

Abstract: Nowadays Educational institutions are concerned about regularity of student attendance. This is mainly due to students' overall academic performance is affected by his or her attendance in the institute. Mainly there are two conventional methods of marking attendance which are calling out the roll call or by taking student sign on paper. They both were more time consuming and difficult. Hence, there is a requirement of computer-based student attendance management system which will assist the faculty for maintaining attendance record automatically. In this project we have implemented the automated attendance system using CMake. We have projected our ideas to implement "Automated Attendance System Based on Facial Recognition", which has large applications. The application includes face identification, which saves time and eliminates chances of proxy attendance because of the face authorization. Hence, this system can be implemented in a field where attendance plays an important role. The system is designed using the CMake platform. The proposed system uses the Principal Component Analysis (PCA) algorithm, which is based on the eigenface approach. This algorithm compares the test image and the training image and determines students who are present and absent. The attendance record is maintained in an Excel sheet, which is updated automatically in the system.

WEB APPLICATION BASED 11 ON-DEMAND HOME SERVICE SYSTEM: A COMPREHENSIVE ANALYSIS

Sarfraj Ahmad, Manasi Gautam, Khushbu Kumari, Raushan Kumar
Computer Science & Engineering

Abstract: The rise of the on-demand economy has revolutionized various industries, including the home services sector. This research paper presents a comprehensive analysis of web application-based on-demand home service systems, focusing on their architecture, functionalities, benefits, challenges, and future prospects. The paper explores the underlying principles and technologies used in developing such systems, including user interfaces, databases, communication protocols, and payment gateways. It discusses the key features and modules required in an on-demand home service system and examine the benefits it offers to service providers, customers, and the overall ecosystem. Furthermore, the paper addresses the challenges associated with implementing and operating these systems, such as trust and safety concerns, service provider management, and ensuring customer satisfaction. Finally, the paper investigates emerging trends and future prospects in on-demand home service systems, highlighting potential advancements in areas like artificial intelligence, automation, and user experience enhancement.

MULTIPLE CHRONIC DISEASE PREDICTION SYSTEM

Aditi Singh, Aman Rawat, Priyanshu Bamania, Sharang Bahuguna
Computer Science & Engineering

Abstract: The burden that chronic diseases place on individuals, healthcare systems, and society at large represents a serious global health challenge. Multiple chronic diseases can be identified and predicted early on, which can considerably improve preventive efforts and patient outcomes. In this paper, machine learning techniques are used to a Multiple Chronic Disease Prediction System (MCDPS). The MCDPS analyses large amounts of medical data to forecast the onset of numerous chronic diseases, including but not limited to diabetes, hypertension, cardiovascular diseases, and chronic respiratory disorders. The system employs modern data mining and predictive modelling approaches to build reliable illness prediction models based on a variety of medical criteria, including patient demographics, lifestyle choices, biomarkers, and medical history. These records go through preprocessing to guarantee data standardization and quality. Then, feature engineering techniques are used to collect relevant data and generate a large set of features. These characteristics include age, gender, BMI, blood pressure, cholesterol levels, and other clinically important markers for patients. In this paper we uses a variety of machine learning techniques to create prediction models, including decision trees, support vector machines, random forests, and deep learning architectures. To guarantee accuracy and generalizability, these models are trained and validated using methods like cross-validation and performance evaluation criteria.

ADAPTIVE TRAFFIC AND CONGESTION MANAGEMENT SYSTEM

Devesh Dutt, Harsh Vikram Shahi, Aman Yadav, Alok Kumar
Computer Science & Engineering

Abstract: Traffic congestion is a major problem in many cities around the world. It can lead to delays, increased pollution, and a decrease in the quality of life. Adaptive traffic and congestion control management is a promising new approach to reducing traffic congestion. This approach uses sensors and data analytics to monitor traffic conditions and adjust traffic signals and other infrastructure in real-time. This can help to keep traffic flowing more smoothly and reduce congestion. There are a number of different adaptive traffic and congestion control management systems available. Some of these systems are designed for specific types of roads, such as highways or city streets. Others are designed for use in specific areas, such as downtown areas or major intersections. The effectiveness of adaptive traffic and congestion control management systems varies depending on a number of factors, such as the type of system, the specific conditions in the area, and the way in which the system is implemented. However, studies have shown that these systems can be effective in reducing traffic congestion and improving traffic flow. The implementation of adaptive traffic and congestion control management systems can be a complex and expensive process. However, the benefits of these systems can be significant. By reducing traffic congestion, these systems can improve the quality of life for residents and businesses in a city. They can also help to reduce pollution and improve air quality.

IMAGE COMPILER

Sapna Sarkar, Anuj Chauhan, Avnish Kumar, Priyanshu Verma
Computer Science & Engineering

Abstract: We are working on a project that can compile our code written in our handwriting. the very basic problem we are solving that most of the students does not have a pe/laptop for compiling their code or program so we providing the facility to compile their code that is simply written on paper textbook by simply clicking the image of that code and in gives the output of code/program on the screen. The reason that click the idea in our mind is that we are also facing this problem with own, so we think and discuss a lot on it and come up with a solution that try to solve the problem in a way that help out in real world and all of the students those want to learn the coding/programming but they do not have a pc/laptops will not face this kind of problem they simply do with write there code and compile with a picture and also help in other way that was a side of teachers if they are checking the notebook/copy checking they get help from it by doing the simple step the code/program the student write on that it correct or not it save the time and provide the accuracy, and that all about our intro. The Image Compiler project aims to develop a powerful and efficient system that converts textual information from images into machine-readable text. This project leverages advanced computer vision techniques and natural language processing (NLP) algorithms to extract meaningful text from images, enabling users to process, analyze, and search for textual content within images. The proliferation of digital images across various domains has created a need for automated methods to extract valuable information from visual data. Traditional optical character recognition (OCR) systems are limited to extracting text from scanned documents or printed materials. However, extracting text from images captured by cameras or embedded in complex scenes remains a challenging task.

HACKATHONS GLIMPSE

The Department of Computer Science and Engineering organized an institute-level internal hackathon. Total 50 teams, 200 students have participated in this event. The primary objective of organizing this hackathon is to foster innovation, creativity, and problem-solving skills by providing a collaborative platform where students can work on real-world challenges within a limited timeframe.

PROJECT EXIBITION GLIMPSES

Shivalik College of Engineering organized Project exhibition for all the department. The primary objective of a project exhibition in college is to provide a multidisciplinary platform for students from all departments to showcase their innovative ideas, technical skills, and project work developed during their academic journey. It aims to encourage creativity, critical thinking, and problem-solving by allowing students to present practical solutions to real-life problems.

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