JIS COLLEGE OF ENGINEERING
NAAC 'A' Accredited Autonomous Institution
Affiliated to MAKAUT

DEPARTMENT OF ELECTRICAL ENGINEERING
NBA TIER-I ACCREDITED

TECHPULSE

ANNUAL MAGAZINE

A LOOK INTO...

THE NEW INVENTIONS OF TECHNOLOGY IN 2021-22

FOLLOW US ON:

2021-2022

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From the Principal's desk

Prof.(Dr.) Partha Sarkar
Principal
JIS College of Engineering

It is with immense pride and pleasure that I present to you this edition of our technical magazine, a testament to the innovation, hard work, and dedication of our students and faculty. As a NAAC A-grade institution, we continue to uphold the highest standards in education and research, empowering our students to become leaders in the ever-evolving field of engineering.

This magazine reflects our commitment to fostering creativity, encouraging intellectual curiosity, and providing a platform for students to showcase their technical expertise. It serves as a mirror to our vibrant academic environment, where learning and practical application go hand in hand. I commend all contributors for their insightful articles, projects, and research, which highlight our collective journey toward excellence.

I encourage all readers to explore the diverse topics and advancements featured in this edition, and I look forward to the continued growth and achievements of our institution. Together, we are shaping the engineers of tomorrow.

From the HOD's desk

Dr. Papun Biswas
HOD, Department of
Electrical Engineering

The growth of the nation largely depends on its youth, their attitude and creativity. Institute like JISCE, Kalyani are here to create innovative technocrats who can contribute significantly towards upliftment of the people of the country. We, at Electrical Engineering Department are committed to fulfill this dream of the country by producing world class Engineers.

As a HOD of this department, I endeavor to transform them into creators of technology with good human values & commitment to our great nation. I request all my faculty members, staff and students to work tirelessly towards developing solutions which are useful for socio-economic growth of the nation.

THE EDITORIAL

OUR EDITORIAL JOURNEY

Welcome to TechPulse, a yearly magazine of the department of Electrical Engineering at JIS College of Engineering. Every edition is a medium through which the ingenuity and hard work of the students of this esteemed institute are valued. This year's edition- "New Inventions of 2021-22" is yet another representation of the same. The students throughout the session have strived for excellence, they have put their best foot forward and made every event a huge success throughout the academic session 2021-22. And so, compiling the student's colossal effort into a few pages wasn't an easy task and wouldn't have been possible without the wonderful core team of TechPulse 2021-22.

It has been a wonderful journey working for the magazine, more so an unparalleled learning experience.

The editorial offers its sincere thanks to Dr. Papun Biswas, HOD, dept. of EE, for entrusting us with this honorous responsibility. We are veritably grateful to Mr. Partha Das, Mrs. Debodyuti Upadhaya and Mrs. Gargi Roy, Asst. Professor of dept. of EE, for being a constant source of motivation and support. This year's magazine brings you the New Inventions of 2021-22. Dive into our feature articles exploring the cutting edge technologies of Quantum Computing, 5G Netwoek, Autonomous Vehicles and Augmented Reality and their immense potential to enhance our life style in the near future.

Cheers!
Team TechPulse

MEET THE TEAM (FACULTY EDITOR)

MRS. GARGI ROY

ASSISTANT PROFESSOR,
DEPARTMENT OF
ELECTRICAL ENGINEERING

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ASSISTANT PROFESSOR,
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MRS. DEBODYUTI UPADHAYA

ASSISTANT PROFESSOR,
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STUDENT EDITOR

Aishwari Mitra

B.Tech, EE, 2nd Year

IT IS AN HONOR TO BE A PART OF THE EDITORIAL TEAM AND I HOPE OUR EFFORTS DO JUSTICE TO THE SAME. THIS EDITION WILL SURELY BE A REMINDER OF THE WONDERFUL YEARS WE'VE SPENT AT JISCE. EACH MEMBER OF THE TEAM HAS CONTRIBUTED TO A PIVOTAL ROLE IN MAKING TECHPULSE A SUCCESS. WE HOPE OUR READERS INDULGE IN REMINISCENCE OF THEIR TIME AND TAKE AWAY VALUABLE KNOWLEGE FROM THIS EDITION. THE TEAM MAY CHANGE BUT THE LEGACY CONTINUES.

Debojyoti Sengupta

B.Tech, EE, 4th Year

Arghya Adhikary

B.Tech, EE, 3rd Year

Vision of the Department

To be a model of excellence in a sustainable ecosystem of technical education, research and innovation by producing the global community of world class aspirations with a great human value, who is prepared for life-long engagement in the rapidly changing opportunities of electrical engineering and related fields.

Mission of the Department

To impart revolutionize quality technical and scientific world class engineering education to our students and produce engineers, technologists, scientists and citizens who will contribute meaningfully to the growth and development for future generation of the country.

To provide a comprehensive, intellectual understanding of electrical engineering built on a foundation of physical science, mathematics, computing and technology with interdisciplinary research and innovation through collaborative work and to educate a new generation of Electrical Engineers to meet the future challenges.

To initiate the students to research-oriented teaching-learning environment in the institute with a professional ethics focus on excellence in curricular, co-curricular and extracurricular activities and innovation.

Program Educational Objectives (PEOs)

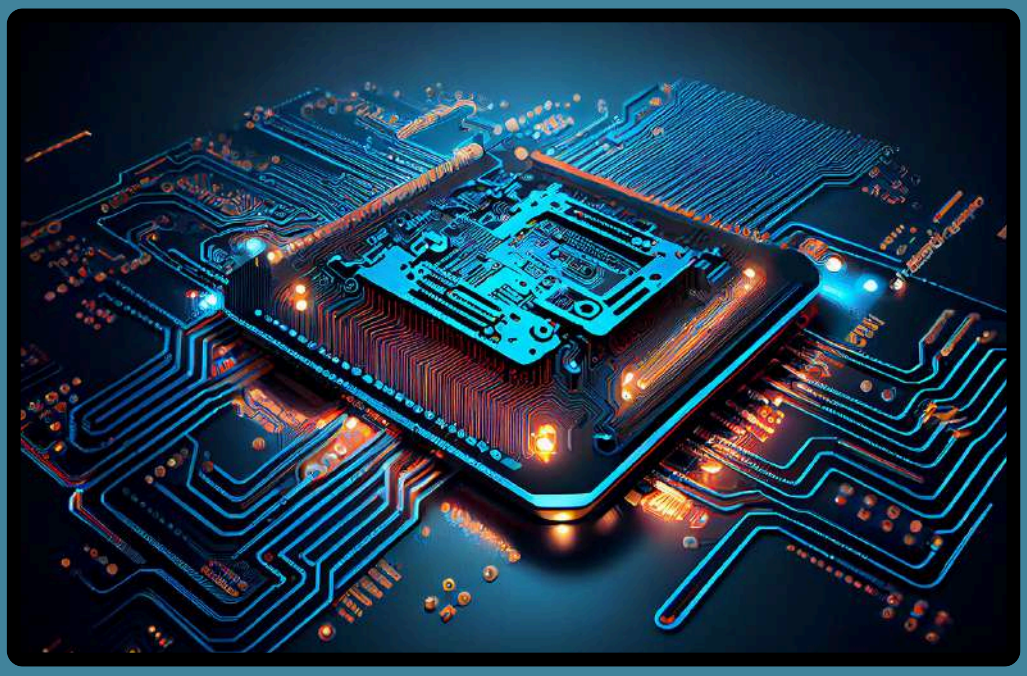
- To provides the necessary background in the field of Electrical Engineering to deal with engineering problems, to pursue higher education in various specialization of electrical engineering and to excel as engineering professional in industries.
- To develop the ability to apply the technical knowledge obtained to solve real life problems and to develop the skilful workforce to carry out the consultancy services o the various related industries.
- To develop a creative mindset towards innovation and entrepreneurship that serve to the need of the industry and society.
- To grow the quality like skill, team work ,leadership and professional ethics, thus contributing towards the growth and development of society.

Program Specific Outcomes (PSOs)

PSO 1: The graduates will able to apply the knowledge of mathematics, science, engineering and professional subjects' fundamentals to solve complex societal problems with professional responsibility and ethics towards the advancement of academic and research pursuits in electrical and allied field for sustainable development.

PSO 2: The graduates will able to conduct investigation or experiments with learned appropriate engineering technique, knowledge skill, resources & modern tool to with the computational proficiency and exposures to frontier technology in order to approach any problem from multidisciplinary angles through projects, seminars and workshops.

PSO 3: The graduate will able to accept social responsibility with the help of professional skill, team spirit and leadership quality with adequate knowledge and find engineering solutions for social, health, safety, environment issues, economics and extracurricular activities.



QUANTUM COMPUTING

Quantum computing is an advanced field of computing that leverages the principles of quantum mechanics to process information in ways that classical computers cannot. Unlike classical computers, which use bits as the smallest unit of data (representing either a 0 or a 1), quantum computers use quantum bits or qubits. Qubits can exist in multiple states simultaneously.

Key Principles of Quantum Computing:

- **Superposition:** In classical computing, a bit is either in the state 0 or 1. In quantum computing, a qubit can be in a state that is a combination (superposition) of both 0 and 1. This property allows quantum computers to process a vast amount of information simultaneously.

- **Entanglement:** When qubits become entangled, the state of one qubit is directly related to the state of another, no matter the distance between them. This correlation between qubits allows quantum computers to perform complex computations more efficiently than classical computers.

- **Quantum Interference:** Quantum algorithms often rely on interference, where quantum states can add or cancel each other out. By carefully controlling interference, quantum algorithms can amplify the correct solutions and cancel out the incorrect ones.

Potential Applications:

Quantum computing holds the potential to revolutionize various fields by solving problems that are currently intractable for classical computers. Potential applications include:

- **Cryptography:** Breaking widely-used cryptographic schemes, while also enabling the development of new, quantum-resistant cryptographic protocols.
- **Optimization:** Solving complex optimization problems in logistics, finance, and materials science.
- **Drug Discovery:** Simulating molecular structures and interactions to accelerate drug discovery and development.
- **Artificial Intelligence:** Enhancing machine learning algorithms by providing more efficient ways to process and analyze large datasets.

Current State and Challenges:

Quantum computing is still in its early stages, with several significant technical challenges to overcome:

- **Qubit Coherence:** Qubits are highly susceptible to decoherence and noise, which can disrupt quantum computations.
- **Error Correction:** Developing efficient quantum error correction methods is crucial to building reliable quantum computers.
- **Scalability:** Scaling up the number of qubits while maintaining their coherence and entanglement is a significant challenge.

Quantum computing represents a paradigm shift in computation, offering the potential to solve problems that are beyond the reach of classical computers. While practical, large-scale quantum computers are still in development, the rapid advancements in this field suggest that they could become a transformative technology in the coming decades.

Rani Roy

B.Tech, EE, 1st Year

EXPANSION OF 5G NETWORK

5G, the fifth generation of mobile network technology, is revolutionizing the way we connect and communicate by offering significantly higher speeds, lower latency, and greater capacity than its predecessors. The global expansion of 5G is a major technological milestone with widespread implications for industries, economies, and everyday life.

Some Key Features of 5G are-

- **Higher Speeds:** 5G networks can theoretically offer speeds up to 10 Gbps, far surpassing the maximum speeds of 4G networks. This enables rapid downloading and uploading of large files, high-definition streaming, and more.
- **Lower Latency:** Latency, or the delay before a transfer of data begins following an instruction, is significantly reduced in 5G networks. 5G aims for latency as low as 1 millisecond, enhancing real-time applications such as online gaming, video conferencing, and autonomous driving.
- **Greater Capacity:** 5G can support a larger number of connected devices per unit area compared to 4G. This is crucial for the growth of the Internet of Things (IoT), enabling smart cities, connected homes, and industrial automation.
- **Improved Reliability:** Enhanced network reliability and connection stability are critical for applications that require consistent performance, such as remote surgery and autonomous vehicles.

Subham Nandy

B.Tech, EE, 2nd Year

AUGMENTED REALITY IN RETAIL

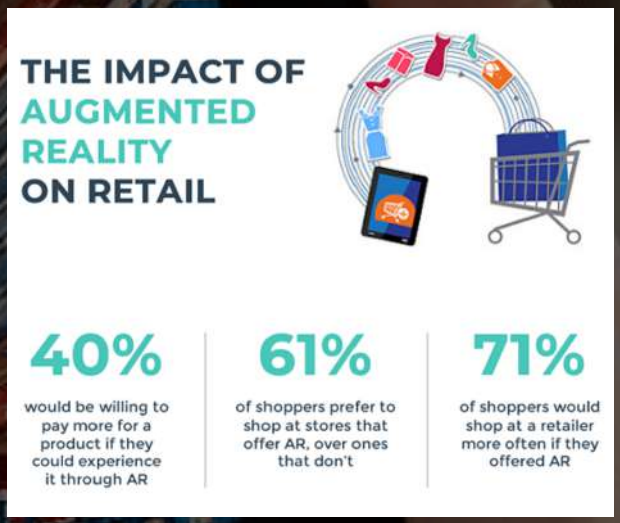
Augmented reality (AR) is transforming the retail industry by enhancing the shopping experience for consumers and providing new opportunities for businesses to engage with their customers. By overlaying digital information and objects onto the physical world, AR allows retailers to create interactive, immersive experiences that can drive sales, improve customer satisfaction, and streamline operations.

Benefits of AR in Retail:

- Improved Customer Experience: AR enhances the shopping experience by providing interactive and personalized content. It helps customers make informed decisions, reducing the likelihood of returns and increasing customer satisfaction.
- Increased Sales: By allowing customers to visualize products and try them virtually, AR can reduce purchase hesitation and boost sales conversion rates. Engaging AR experiences can also attract more customers to stores and e-commerce platforms.
- Brand Differentiation: Retailers that leverage AR can differentiate themselves from competitors by offering innovative and memorable shopping experiences. This can enhance brand perception and loyalty.
- Enhanced Marketing and Engagement: AR provides new ways for retailers to interact with customers through immersive marketing campaigns. AR-powered ads and promotions can capture attention and drive engagement both in-store and online.

- *Data Collection and Insights: AR applications can collect valuable data on customer preferences and behaviors. This information can be used to optimize product offerings, personalize marketing efforts, and improve overall business strategies.*

Augmented reality is poised to reshape the retail industry by providing immersive and interactive shopping experiences. As technology continues to advance and customer expectations evolve, AR offers retailers a powerful tool to enhance customer engagement, drive sales, and differentiate their brand. By overcoming the challenges and strategically integrating AR into their operations, retailers can unlock new opportunities for growth and innovation in the competitive retail landscape.



Ishita Chowdhury
B.Tech, EE, 3rd Year

IMPACTS OF AUTONOMOUS VEHICLE

The advent of autonomous vehicles (AVs) is poised to have a transformative impact on various aspects of society, economy, and the environment. These impacts can be both positive and negative, and they span a wide range of sectors including transportation, urban planning, public safety, employment, and beyond.

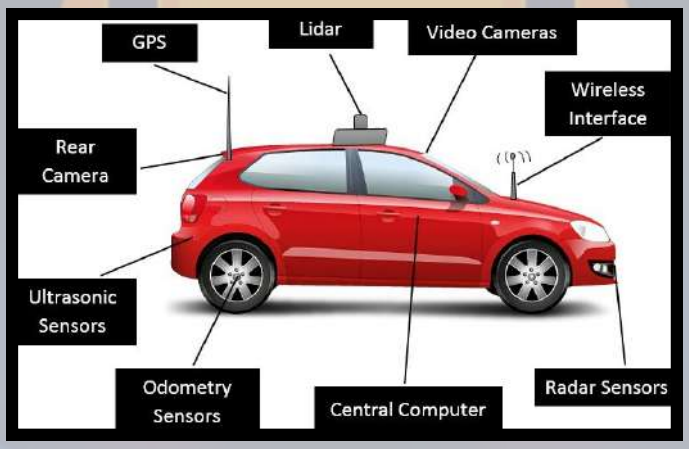
The positive impacts of this are:

- **Improved Safety:** *AVs have the potential to significantly reduce traffic accidents caused by human error, which accounts for the vast majority of crashes. Advanced sensors and algorithms enable AVs to detect and respond to their environment more quickly and accurately than human drivers.*
- **Increased Mobility:** *Autonomous vehicles can provide greater mobility for individuals who are unable to drive, such as the elderly, disabled, and those without a driver's license. This can enhance their independence and quality of life.*
- **Reduced Traffic Congestion:** *AVs can optimize traffic flow and reduce congestion through vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) communication. Coordinated driving patterns and efficient routing can minimize traffic jams and reduce travel time.*
- **Environmental Benefits:** *Autonomous vehicles can contribute to lower emissions by optimizing driving patterns, reducing idling, and enabling more efficient use of electric vehicles. Additionally, shared autonomous vehicle fleets can decrease the number of vehicles on the road, further reducing environmental impact.*
- **Economic Efficiency:** *AVs can reduce the costs associated with road accidents, including medical expenses, vehicle repairs, and insurance premiums. Businesses can benefit from lower transportation costs and increased efficiency in logistics and supply chain operations.*

The Negative impacts of this are:

- ***Job Displacement:*** The widespread adoption of AVs could lead to significant job losses in driving-related professions, including truck drivers, taxi and rideshare drivers, and delivery personnel. This could have a substantial economic impact on individuals and communities dependent on these jobs.
- **Security and Privacy Concerns:** The connectivity required for AVs to operate raises concerns about cybersecurity and the potential for hacking. Additionally, the collection and sharing of data by AVs can lead to privacy issues for users.
- **Ethical and Legal Challenges:** The deployment of AVs raises complex ethical and legal questions, such as liability in the event of an accident and decision-making in critical situations where harm is unavoidable. Establishing clear regulatory frameworks will be essential.
- **Initial High Costs:** The development and deployment of AV technology are expensive, which may make AVs initially unaffordable for many consumers. The cost of upgrading infrastructure to support AVs can also be significant.
- **Transition Period Challenges:** During the transition period when both autonomous and human-driven vehicles share the road, there may be challenges related to mixed traffic. Ensuring the safety and efficiency of this hybrid environment will be crucial.

The impacts of autonomous vehicles are far-reaching and multifaceted, offering significant benefits while also posing considerable challenges. As technology advances and AVs become more integrated into society, careful planning and regulation will be essential to maximize their positive impacts and mitigate potential downsides. The transition to a future with autonomous vehicles will require collaboration among policymakers, industry leaders, and communities to ensure that the benefits are broadly shared and the challenges are effectively addressed.



Spandan Mitra

B.Tech, EE, 3rd Year

WHAT IS PERSONALIZED MEDICINE?

Personalized medicine, also known as precision medicine, represents a paradigm shift in healthcare, where medical treatment and healthcare strategies are tailored to the individual characteristics of each patient. This approach considers genetic, environmental, and lifestyle factors to provide more accurate diagnoses, effective treatments, and preventive measures. Personalized medicine aims to move away from the traditional one-size-fits-all model to a more individualized approach that can lead to better patient outcomes and more efficient healthcare systems.

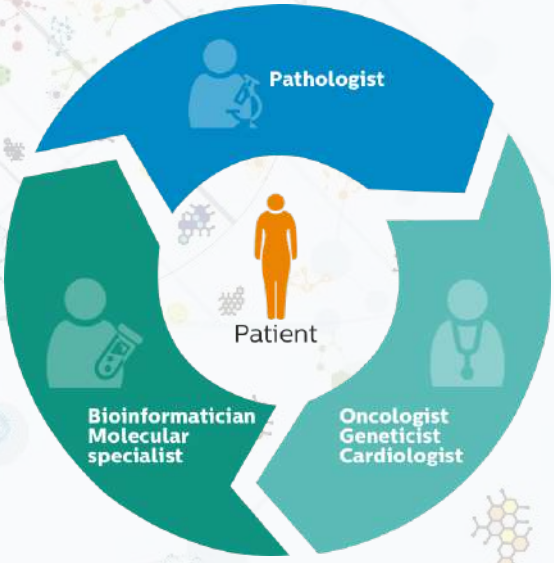
Benefits of Personalized Medicine:

- **Improved Patient Outcomes:**

Tailoring treatments to the individual characteristics of each patient can lead to more effective therapies, faster recovery times, and reduced adverse reactions. This approach can significantly improve patient outcomes and quality of life.

- **Prevention and Early Detection:**

Personalized medicine enables the identification of individuals at high risk for certain diseases. Early detection and preventive measures can be implemented to reduce the likelihood of disease development and progression.



- **Cost-Effective Healthcare:**

By avoiding ineffective treatments and reducing the trial-and-error approach,

personalized medicine can lead to cost savings for both patients and healthcare systems. Targeted therapies can also reduce hospitalizations and complications.

- **Enhanced Drug Development:**

Personalized medicine can streamline the drug development process by identifying patient populations that are more likely to benefit from new therapies. This can lead to more efficient clinical trials and faster approval of new drugs.

Current and Future Applications:

- **Oncology:** Cancer treatment has been at the forefront of personalized medicine. Molecular profiling of tumors allows for targeted therapies that are tailored to the specific genetic mutations driving a patient's cancer, leading to more effective and less toxic treatments.
- **Cardiology:** Personalized medicine is being used to identify genetic factors that contribute to heart disease risk and to tailor treatments for conditions such as hypertension and hypercholesterolemia.
- **Neurology:** Research in personalized medicine is uncovering genetic and molecular factors associated with neurological disorders such as Alzheimer's disease, Parkinson's disease, and multiple sclerosis, paving the way for targeted therapies and preventive strategies.
- **Pharmacology:** Pharmacogenomic testing is becoming more common in guiding drug prescriptions for various conditions, including depression, diabetes, and infectious diseases, to ensure that patients receive the most effective medications with the fewest side effects.

Personalized medicine represents a transformative approach to healthcare, offering the potential for more precise, effective, and tailored treatments. While significant challenges remain, the ongoing advancements in genomics, data analytics, and biotechnology are driving the field forward. As personalized medicine continues to evolve, it promises to improve patient outcomes, enhance the efficiency of healthcare systems, and pave the way for a new era of medical innovation and individualized care.

Deb Sekhar Roy
B.TEch, EE, 4th Year

BLOCKCHAIN BEYOND CRYPTOCURRENCY

Blockchain technology has emerged as a groundbreaking innovation with the potential to revolutionize various industries. By providing a secure, decentralized, and transparent system for recording and verifying transactions, blockchain has garnered significant attention beyond its association with cryptocurrencies like Bitcoin.

At its core, blockchain is a distributed ledger that enables the storage and management of data across multiple nodes in a network. It operates on a peer-to-peer basis, eliminating the need for intermediaries and central authorities. This decentralized nature makes blockchain highly resistant to tampering and fraud.
One of the key principles underlying blockchain technology is its immutability. Once data is added to the blockchain, it becomes virtually impossible to alter or delete. This ensures the integrity and reliability of the information stored on the blockchain.

Blockchain technology relies on several essential components to function effectively. These include cryptographic algorithms, consensus mechanisms, and smart contracts. Cryptographic algorithms ensure the security and privacy of transactions, while consensus mechanisms enable the agreement of network participants on the validity of data. Smart contracts, on the other hand, are self-executing contracts with predefined conditions that are automatically enforced.

Debraj Pal

B.Tech, EE, 4th Year

DELVE INTO THE FUTURISTIC WORLD OF...

NEW INVENTIONS OF 2021-22

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