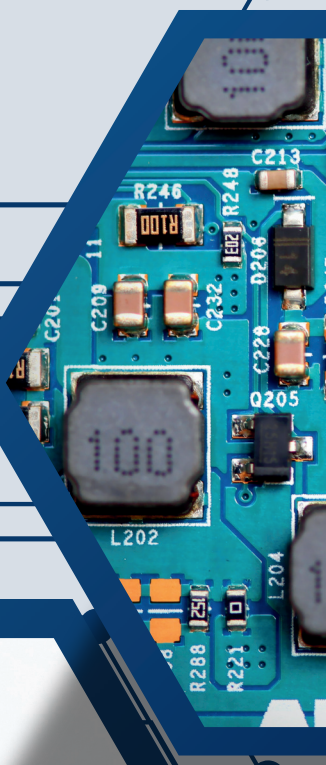
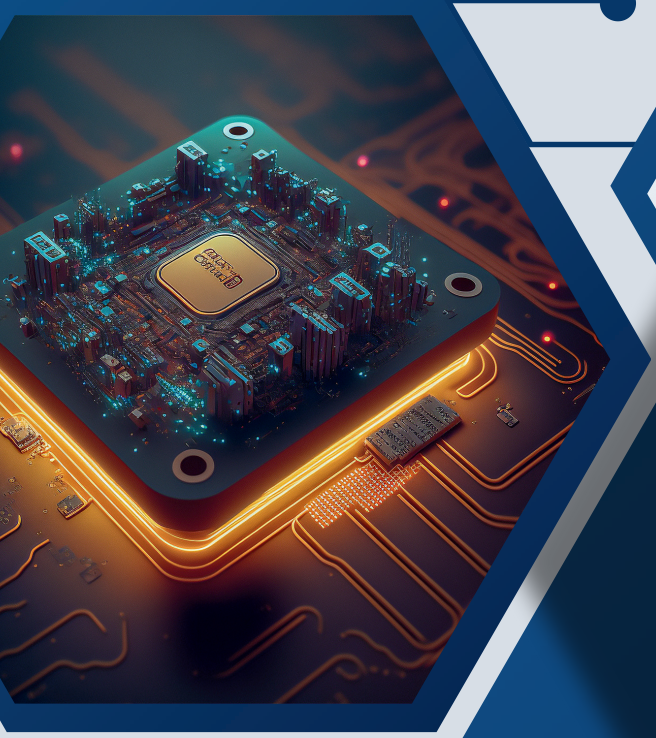
People's Education Trust (R), Mandya

P.E.S. College of Engineering

(An Autonomous Institution Aided by Government of Karnataka, Affiliated to VTU, Belagavi)

TECHNICAL MAGAZINE





Department of Electronics & Communication Engineering

PESCE CET CODE: E023 | PESCE COMEDK CODE: E089

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About the P. E. S. College of Engineering, Mandya

P. E. S. College of Engineering, Mandya established in 1962 under the aegis of the PET (R) Mandya, is a top notch engineering college in Karnataka with the state-of-the-art equipment, infrastructural facilities and National standard sports facilities. PESCE is a premier technical institutes delivering quality technical education. The Institute was started by a great visionary, Late Sri K V Shankara Gowda, and is now successfully moving ahead under the able leadership of Sri K S Vijay Anand, Chairman, People's Education Trust®, Mandya. The college is making great forays in the arena of technical higher education. It is one of the Pioneer Technical Institutes in the country and has gained a very good reputation by some outstanding achievements of the faculty and students. The institution is functioning under the Grant-in-Aid scheme of Government of Karnataka, permanently affiliated to Visvesvaraya technological University (VTU), Belagavi, become autonomous in the year 2008. The institute is recognized by All India Council for Technical Education (AICTE), New Delhi and all UG Programs are accredited by National Assessment and Accreditation Council (NAAC), and all the UG programmes are accredited by National Board of Accreditation (NBA), New Delhi. Further, the institution has secured 137 th rank at National-level in the Ministry of Education's National Institutional Ranking Framework (NIRF) – 2022, and the institute has recognised in the band "PERFORMER" under the category "Colleges/Institutes (Govt. and Govt. Aided) (Technical)" in Atal Ranking of Institutions on Innovation Achievement (ARIIA) 2021, a flagship program of the Ministry of Education, Government of India. The institute offers Under Graduate, Post Graduate and Doctoral programs in various engineering disciplines.

About the Department of Electronics & Communication Engineering

The department of Electronics and Communication Engineering was incepted in the year 1967 with an undergraduate program in Electronics and Communication Engineering. Initially program had an intake of 60 students and presently 150 students graduate every year. The long journey of 50 years has seen satisfactory contributions to the society, nation and world. The alumni of this department have strong global presence making their alma mater proud in every sector they represent. Department has started its PG program in the year 2012 in the specialization of VLSI design and Embedded systems. Equipped with qualified and dedicated faculty department has focus on VLSI design, Embedded systems and Image processing. The quality of teaching and training has yielded high growth rate of placement at various organizations. Large number of candidates pursuing research programs (M.Sc/Ph D) is a true testimonial to the research potential of the department. The Department is recognized as Research Centre by V T U and Mysore University offers part time and full time Ph.D. Programs.

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MESSAGE FROM HOD

It is with immense pride and joy that I introduce TECHNOVA, the technical magazine of our department for the academic year 2022-23.

TECHNOVA acts as a dynamic platform for our students and faculty to present their technical insights, innovative concepts, research contributions, and creative works. This magazine embodies the spirit of inquiry, learning, and collaboration that characterizes our department.

In an era of rapid technological advancement, it is crucial not only to acquire knowledge but also to communicate it effectively. Platforms such as TECHNOVA play a vital role in developing these skills and motivating students to pursue lifelong learning, critical thinking, and problem-solving. I am delighted to witness the enthusiasm and commitment demonstrated by our students and faculty in contributing to this edition.

I would like to express my heartfelt gratitude to the entire editorial team, faculty coordinators, and all contributors for their hard work in bringing this magazine to fruition. I hope that TECHNOVA continues to inspire innovation and promote academic excellence in the future.
Wishing everyone the very best!

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MESSAGE FROM STAFF EDITOR

It gives me immense pleasure as our Department of Electronics and communication presents the consecutive edition of our department's annual technical magazine "TechElevate 2022-2023" to our dear readers. This year we are showcasing innovative ideas and hidden talents of our young minds. The magazine's objective is to provide a platform for our students and faculties to augment with its technology focus and scope. This magazine is a testament to the collective efforts of our students and faculty who continuously strive to push the boundaries of technology and knowledge.

As the editor, I am thrilled to present a compilation of thought-provoking articles and inspiring stories that highlight the incredible talent within our department. This magazine is more than just a publication; it is a celebration of creativity, teamwork, and a shared vision for the future of engineering.

I would like to extend my heartfelt gratitude to our contributors who have shared their expertise, projects, and ideas to make this magazine a reality. A special thanks to our faculty members for their unwavering support and guidance throughout this journey. Your encouragement has been instrumental in bringing this vision to life.

To our readers, I hope this magazine serves as a source of inspiration, learning, and curiosity. Whether you are a student eager to explore new technologies, a researcher delving into cutting-edge innovations, or a professional seeking insights into the future of our industry, there is something here for everyone.

Thank you for being a part of this journey. Together, let us continue to explore, innovate, and contribute to the ever-evolving world of Electronics and Communication Engineering.

Happy reading!

Warm regards,

Dr. B. S. Nanda
Professor
Editor
Department of Electronics and Communication Engineering
PES College of Engineering, Mandya

VISION MISSION AND PROGRAM EDUCATIONAL OBJECTIVES

Vision of the Department:

The department of E & C would endeavour to create a pool of Engineers who would be extremely competent technically, ethically strong also fulfil their obligation in terms of social responsibility.

Mission of the Department:

M1: Adopt the best pedagogical methods and provide the best facility, infrastructure and an ambience conducive to imbibe technical knowledge and practicing ethics.

M2: Group and individual exercises to inculcate habit of analytical and strategic thinking to help the students to develop creative thinking and instil team skills.

M3: MoUs and Sponsored projects with industry and R & D organizations for collaborative learning.

M4: Enabling and encouraging students for continuing education and molding them for life-long learning process.

Program Educational Objectives (PEOs):

The Graduate of the Bachelor of Engineering (BE) program in ECE during four year term, aims at:

PEO 1: Graduates to exhibit knowledge in mathematics, engineering fundamentals applied to Electronics and Communication Engineering for professional achievement in Industry, research and academia.

PEO 2: Graduates to identify, analyze and apply engineering concepts for design of Electronics and Communication systems and demonstrate multidisciplinary expertise to handle societal needs and meet contemporary requirements.

PEO 3: Graduates to function with leadership qualities, team spirit, management skills, attitude and ethics need for successful career, sustained learning and entrepreneurship.

Program Specific Outcomes (PSOs):

- An ability to understand the basic concepts in Electronics & Communication Engineering and to apply them in the design and implementation of Electronics and communication systems.
- An ability to solve complex problems in Electronics and Communication Engineering, using latest hardware and software tools, along with analytical skills to arrive at appropriate solutions.

Contents

Articles by Faculties

1.The Evolution And Impact Of 5G Wireless Communication

In the telecommunications, the advent of 5G technology marks a significant leap forward, promising unparalleled speed, reliability, and connectivity. As the fifth generation of wireless technology, 5G builds upon its predecessors, aiming to revolutionize not just communication but entire industries and everyday life.

One of the most important features of 5G is its remarkable speed. It offers data transfer rates up to 100 times faster than 4G, with potential speeds exceeding 10 gigabits per second. This rapid transmission capability empowers users to download large files in seconds and stream high-definition content without buffering. Such speed is made possible through advanced technologies like millimeter waves and small cell networks, which increase bandwidth and reduce latency.Reduced latency is another critical aspect of 5G. Latency refers to the delay between sending and receiving information. 5G aims for latency as low as 1 millisecond, significantly enhancing real-time applications like autonomous vehicles, remote surgery, and augmented reality (AR) experiences. This near-instantaneous responsiveness is crucial for applications requiring split-second decision-making and precise control.

5G networks are designed to accommodate a vast number of connected devices simultaneously. This capability is essential as we move towards an increasingly interconnected world with billions of Internet of Things (IoT) devices. From smart cities to industrial automation, 5G promises seamless connectivity, enabling devices to communicate efficiently and securely.The impact of 5G extends beyond faster smart phones. Industries such as healthcare, transportation, and manufacturing stand to benefit significantly. In healthcare, 5G facilitates remote patient monitoring and telemedicine, enhancing access to healthcare services and improving patient outcomes. In transportation, it supports vehicle-to-vehicle communication, paving the way for safer autonomous driving. Meanwhile, in manufacturing, 5G enables real-time monitoring and control of processes, leading to increased efficiency and productivity.Despite its promise, the rollout of 5G poses challenges. Infrastructure requirements are substantial, necessitating significant investment in new towers and equipment. Additionally, concerns about cyber security and privacy must be addressed to ensure the safe deployment of 5G technology.

In conclusion, 5G wireless communication represents a transformative advancement poised to reshape how we live, work, and interact. With its unparalleled speed, low latency, and capacity for connectivity, 5G is set to drive innovation across various sectors, unleashing new possibilities and enhancing our digital landscape. As the global rollout continues, the full potential of 5G awaits, promising a future where connectivity is faster, smarter, and more accessible than ever before.

Vidyashree B P
Assistant professor
Department of ECE
PESCE, Mandya

2.Reusable Launch Vehicles (RLV): An Introduction

"Pushpak" ISRO's Reusable Launch Vehicle Technology Demonstrator (RLV-TD) program

Benefits:

Traditional rockets are discarded after single use.

RLVs are designed to be recovered and launched again. The benefit is lower cost per launch and more frequent missions can take place.

ISRO's RLV Program

Design Philosophy:

ISRO's RLV-TD is a winged spaceplane designed for horizontal landings. This design offers advantages in terms of maneuverability and potentially lower fuel consumption during re-entry.

Development Strategy:

ISRO has adopted a more cautious and methodical approach, conducting extensive ground testing and suborbital flights before venturing into orbital missions.

Current Stage:

ISRO has successfully demonstrated the core technologies needed for a reusable launch vehicle with the RLV-LEX series.

Challenges and Opportunities

Technical Hurdles:

Reusable launch vehicles require advanced heat shielding to withstand the intense temperatures encountered during re-entry. Additionally, perfecting the complex landing maneuvers for both winged and VTOL (vertical take-off and landing) designs is crucial.

Economic Viability:
While reusability promises significant cost savings in the long run, the initial development costs for RLVs are high. Despite these challenges, the potential benefits of RLVs are immense.

Reduce Launch Costs:
Reusability can drastically lower the cost of space access, enabling more frequent missions and opening up space for new ventures.

Enable Sustainable Space Exploration:
Space debris are defunct human-made objects in space which no longer serve a useful function. By reducing the amount of debris left in orbit after each launch, RLVs contribute to a more sustainable space environment.

Revolutionize Space Travel:
Reusable launch vehicles hold the key to making space travel more accessible and affordable, paving the way for a future with regular space missions and potentially even space tourism.ISRO recently completed the third and final flight of the RLV-LEX series on June 23rd, 2024. This mission, named RLV-LEX-03 or "Pushpak," successfully landed under more challenging wind conditions, signifying a significant step towards a fully operational RLV. It is named "Pushpak", after the mythical flying chariot Pushpaka Vimana.

The RLV-TD is a test bed for crucial technologies needed for a fully reusable launch system.

For more information on RLV-TD, please visit https://www.isro.gov.in/RLVTD.html

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3.Quantum Cryptography In Cyber Security

Quantum cryptography (also known as quantum encryption) refers to various cyber security methods for encrypting and transmitting secure data based on the naturally occurring and immutable laws of quantum mechanics. It also refers as encrypting messages using quantum physics. Quantum key distribution (QKD) enables two distant persons to communicate securely with each other using a sequence of quantum-mechanically shared secret bits called the key. The five pillars/principles of

cryptography are confidentiality, integrity, authenticity, non-repudiation, and availability, ensuring secure communication and data protection. Unlike traditional cryptography, which is built on mathematics, quantum cryptography is built on the laws of physics

In cyber security, “quantum security” is crucial due to quantum computing potential to undermine encryption. This emerging field aims to develop quantum-resistant algorithms to protect digital communications against quantum threats. Quantum cryptography is a method of encryption that uses the naturally occurring properties of quantum mechanics to secure and transmit data in a way that cannot be hacked. Cryptography is the process of encrypting and protecting data so that only the person who has the right secret key can decrypt it. Some of the applications of Quantum Cryptography include: Financial transactions: Quantum Cryptography can provide a secure communication channel for financial transactions, making it impossible for cybercriminals to intercept and steal sensitive financial information.

Cryptography is the process of hiding or coding information so that only the person to whom the message was intended can read it. The art of cryptography has been used to code messages for thousands of years and continues to be used in bank cards, computer passwords, and ecommerce. It protects information and communications through codes so only those for whom the information is intended can read and process it.

There are three main types of cryptography: symmetric key encryption, asymmetric key encryption, and public-key encryption. The most used asymmetric cryptography algorithms are RSA and ECC. The RSA algorithm is based on public-key encryption technology which is a public-key cryptosystem for reliable data transmission. The security token or the authentication token is the one that is considered as the cryptography tool. Using the security token, one can authenticate the user. It is also used to provide statefulness to the HTTP protocol. The security token has to be encrypted to allow the secure exchange of data.

While still in its early stages, quantum encryption has the potential to be far more secure than pre quantum encryption has the potential to be far more secure than previous types of cryptographic algorithms and even theoretically unhackable. C is commonly used for cryptography—the practice of encrypting data so that it cannot be understood without access to a key. C can also be used for network security—for example, by creating firewalls that prevent unauthorized access to private networks. Python is also a popular language for cryptography.

“What makes it secure is the fact that you cannot clone a single photon, hence if the channel is eavesdropped, it will be immediately detected. Quantum key distribution is important because it is the only way to ensure an absolutely secured connection protected by law of quantum physics.”

Cryptography is a complex field that requires a strong foundation in mathematics and computer science. In today's digital landscape, cryptography plays a vital role in our daily lives, ensuring that sensitive data like credit card numbers, e- commerce transactions and even WhatsApp messages remain confidential and secure from cyber frauds.

Cryptography provides for secure communication in the presence of malicious third-parties known as adversaries. Encryption uses an algorithm and a key to transform an input (i.e., plaintext) into an encrypted output (i.e., cipher text).

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4.Wireless Battery Charging

Wireless charging eliminates the cable typically required to charge mobile phones, cordless appliances and so on. With a wireless charger, the battery inside any battery-powered appliance can be charged by simply placing the appliance close to a wireless power transmitter or a designated charging station. As a result, the appliance casing can be made completely sealed, even waterproof. Besides the inherent convenience it offers, wireless charging can also greatly enhance reliability, since the charging plug on the side of an appliance can suffer mechanical damage easily, or simply by someone inadvertently plugging in the wrong adapter. The underlying principle behind wireless charging is the well-known Faraday's law of induced voltage, commonly used in motors and transformers.

The wireless charging transmitter is powered by an input DC rail of 5 V to 19 V, typically derived from a USB port or an AC/DC power adapter. A switched transistor bridge using two or four FETs drives a coil and series capacitor. A resonant frequency is set internally, by means of the series capacitor. The transmitter has a coil to transfer power by electromagnetic induction. Some transmitters support multi-coil arrays, driven by separate bridges which are automatically selected to deliver the highest coupled power into the wireless power receiver. The induced power is coupled to the wireless power receiver, which has a similar coil to collect the incoming power. The receiver rectifies the power by means of diode rectifiers, usually made of FETs for improving the efficiency. It also filters the power using ceramic output capacitors, and then applies it to the battery that needs to be charged, either through a linear stage or a switching regulator. The battery inside the portable device receives the power and charges up. The receiver can command the transmitter to adjust the charging current or voltage, and also to stop transmitting power completely when end of charge is indicated.

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5.First flexible graphene - based display created

Flexible electronics, or flex circuits, are a technological breakthrough allowing devices to bend, stretch, or fold while maintaining functionality. Enabled by advancements in materials like organic semiconductors, conductive polymers, and flexible substrates (e.g., plastic and ultra-thin glass), these circuits unlock innovative design possibilities. Their adaptability paves the way for transformative applications across industries such as consumer electronics, healthcare, and industrial monitoring. Recent advancements in materials and manufacturing are driving the widespread adoption of flexible electronics. Researchers are creating durable and efficient materials like graphene and other 2D materials, known for their exceptional electrical and mechanical properties. Graphene is created using screens of flexible plastic and is the first time graphene has been used in a transistor-based flexible device, Instead of being composed of sheets of glass.

A new flexible display technology uses a graphene-based backplane, printed at low temperatures (<100°C), instead of traditional metal electrodes. This method, developed by Plastic Logic, offers a low-cost, high-volume solution for flexible screens. The technology has potential for future applications in LCD/OLED displays, medical imaging, and gesture recognition, with advantages in cost, manufacturing ease, and flexibility.

Flexible electronics are driving innovation across industries-Consumer Electronics, Healthcare, Industrial and Environmental Monitoring, Automotive and Aerospace. Flexible electronics face challenges such as ensuring the durability and performance of materials, achieving cost-effective mass production, and overcoming issues with standardization and integration with existing technologies. The future of flexible electronics is promising, with expected breakthroughs in the next decade. These advancements will lead to more sophisticated and versatile devices, playing a key role in the development of the Internet of Things (IoT) and smart environments, where adaptability and seamless integration are crucial.Flexible electronics represent a groundbreaking technological advancement, unlocking new design possibilities across industries. As research progresses, they are expected to become more widespread and influential, shaping the future of technology in innovative ways. These advancements promise to transform how we interact with electronic devices, driving significant progress in consumer electronics, healthcare, industrial monitoring, automotive, and aerospace sectors.

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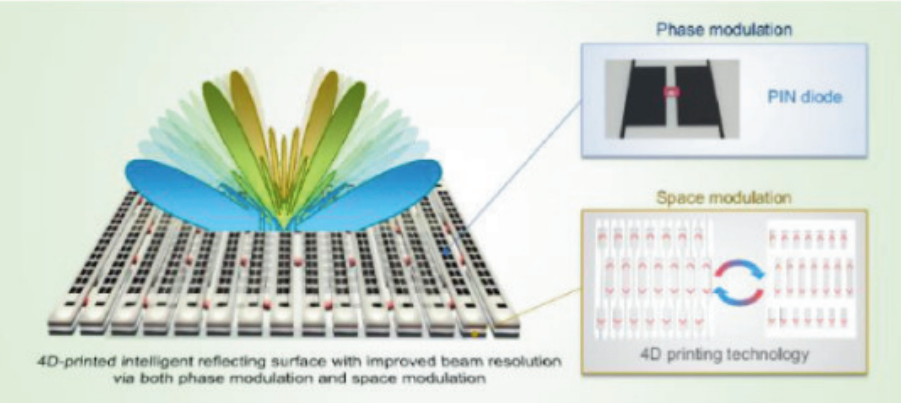
Articles by Students

1. **4D-Printed Intelligent Reflecting Surface With Improved Beam Resolution Via Both Phase Modulation And Space Modulation**



Recently, intelligent reflecting surfaces (IRSs) have emerged as potential candidates for overcoming the line-of-sight issue in 5 G/6 G wireless communication. These IRSs can manipulate the direction of reflected beams, enabling efficient beam steering to enhance the performance of wireless communication. Each unit cell (or unit structure) of an IRS commonly consists of electrical elements for phase modulation. However, by employing phase modulation alone, an IRS can steer the reflected electromagnetic waves toward only discrete and specific angles, leaving a wide range of out-of-beam areas. In this work, an IRS that uses both phase modulation and space modulation is presented to improve the beam resolution and continuously cover out-of-beam areas that phase modulation alone cannot address. A positive-intrinsic-negative diode is mounted on a unit cell for phase modulation, and a 4D-printed reconfigured structure is fabricated to demonstrate space modulation. The beam-steering function is achieved by alternating the states of the diodes in the same columns, while the beam resolution is improved by controlling the gaps between the columns. The functions are first theoretically and numerically analysed and then experimentally verified, demonstrating that additional angles of −46°/+50°, −22°/+14°, and −16°/+12° are achieved with space modulation and −60°/+62°, −30°/+22°, and ±16° are achieved by phase modulation alone. The proposed IRS offers the possibility of functional integration in a variety of indoor applications within the wireless communication field.

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2.ARM Technologies

Arm (Advanced RISC Machine) Technologies is a leading semiconductor and software design company that provides the technology behind the world's most advanced digital products. Founded in 1990 and based in Cambridge, UK, Arm has revolutionized the computing industry with its energy-efficient processor designs, which are used in billions of devices worldwide. Arm's core business is licensing its processor designs to other companies, who then use these designs to create their own chips. This licensing model has enabled Arm to become a dominant force in the mobile computing market, with its processor designs powering nearly all smartphones and tablets. In recent years, Arm has expanded its reach into other markets, including automotive, Internet of Things (IoT), and data centers. Arm's processor designs are based on a reduced instruction set computing (RISC) architecture, which is known for its simplicity and efficiency. This architecture allows Arm to create processors that are both powerful and energy-efficient, making them ideal for a wide range of applications.

In addition to its processor designs, Arm also offers a variety of other technologies, including graphics processing units (GPUs), machine learning accelerators, and security solutions. These technologies are used by Arm's partners to create a wide range of products, from smartphones and tablets to self-driving cars and smart cities. Arm's commitment to innovation has led to a number of groundbreaking technologies, including the development of the first 64-bit mobile processor and the first machine learning accelerator for mobile devices. Arm is also a leader in the development of energy-efficient computing technologies, which are essential for addressing the growing demand for computing power while minimizing environmental impact.

Arm's success can be attributed to a number of factors, including its innovative technology, its strong partnerships with leading semiconductor companies, and its commitment to open collaboration. Arm's open ecosystem allows developers to create a wide range of applications and services for Arm-based devices, further driving the adoption of Arm technology. As the world becomes increasingly connected and data-driven, Arm's technology is poised to play an even more critical role in shaping the future of computing. Arm's focus on energy efficiency, security, and innovation will continue to drive the development of new and exciting products and services that will benefit consumers and businesses alike.

Figure: Circuit board on Arm chip Technologies in Various Sectors

Arm’s dominance in the mobile market and growing influence in emerging technologies like 5G, AI, and edge computing positions the company as a critical player in the ongoing evolution of computing. The company's chips are found in billions of devices worldwide, with a far-reaching impact on sectors ranging from consumer electronics to industrial applications. As the world increasingly embraces connected technologies, Arm’s energy-efficient, scalable, and customizable processor designs will remain integral to the future of computing, from mobile devices to cloud infrastructure and beyond.

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3.Reconfigurable Antennas

Reconfigurable antennas are a significant advancement in modern antenna technology, designed to adapt dynamically to changing system requirements or environmental conditions. Unlike traditional antennas that operate at fixed parameters, reconfigurable antennas can alter their characteristics such as frequency, radiation pattern, and polarization, offering exceptional versatility for emerging wireless communication systems. Their ability to provide multiple functionalities within a single compact structure makes them particularly valuable in applications where space, efficiency, and adaptability are crucial, such as mobile communication, satellite systems, radar, and cognitive radio networks.

Another important capability of reconfigurable antennas is radiation pattern control. Pattern reconfigurable antennas are designed to modify their radiation pattern, allowing them to focus their beam in specific directions while minimizing radiation in undesired directions. This is typically achieved through switching mechanisms or phased-array configurations. By steering their beams, these antennas enhance signal strength, reduce interference, and improve overall system performance. Such antennas are critical for

Polarization configurability is another aspect that significantly enhances antenna performance. Polarization refers to the orientation of the electromagnetic wave's electric field, and reconfigurable antennas can switch between different polarizations states such as linear, circular, or elliptical. This adaptability improves signal reception, mitigates fading, and enhances communication reliability, particularly in multipath environments where signal reflections cause polarization variations. Such antennas are widely employed in multiple-input-multiple-output (MIMO) systems, satellite communications, and wireless sensor networks.

The implementation of reconfigurable antennas relies on various techniques and technologies. Electronic switches, such as PIN diodes and varactor diodes, are frequently used to change antenna parameters efficiently. MEMS-based switches have also gained popularity due to their low insertion loss, compact size, and reliability. In addition, advanced materials like liquid crystals, graphene, and metamaterials are being explored to develop next-generation reconfigurable antennas with enhanced performance and flexibility.

Reconfigurable antennas are particularly relevant in the era of modern wireless systems, where the demand for multifunctionality, flexibility, and efficiency continues to grow. Their ability to dynamically adapt to varying requirements makes them ideal for emerging technologies such as 5G, Internet of Things (IoT), and beyond. By reducing the need for multiple fixed antennas, they save space, lower costs, and improve overall system performance. As research in materials science, electronic components, and antenna design advances.

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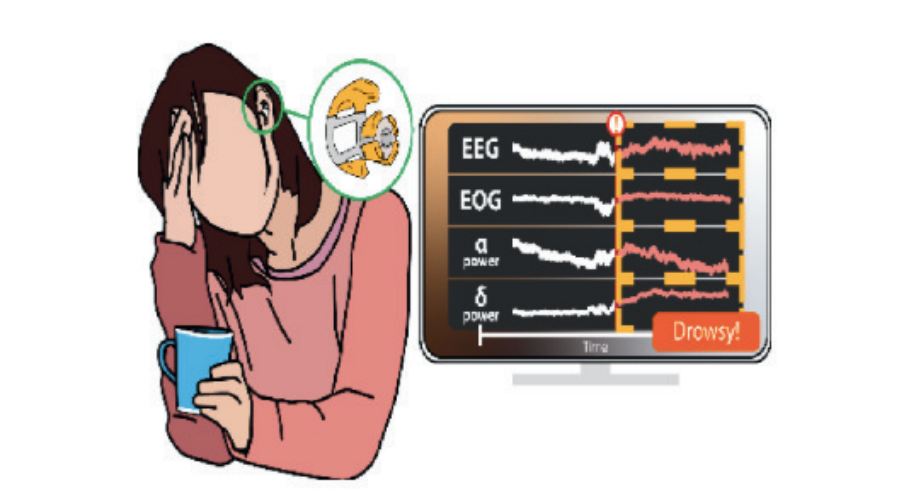
4. Wireless Ear EEG To Monitor Drowsiness

Drowsiness detection is critical for ensuring safety in various domains, including driving, workplace performance, and healthcare monitoring. Electroencephalography (EEG)-based solutions are highly effective for tracking brain activity and assessing drowsiness levels. However, traditional EEG systems are often bulky, invasive, and impractical for real-world use. Recent advancements in wireless and wearable technologies have led to the development of wireless ear EEG devices, which offer a non-invasive, compact, and user-friendly solution for continuous drowsiness monitoring.



Neural wearables can enable life-saving drowsiness and health monitoring for pilots and drivers. While existing in-cabin sensors may provide alerts, wearables can enable monitoring across more environments. Current neural wearables are promising but most require wet-electrodes and bulky electronics. This work showcases in-ear, dry-electrode earpieces used to monitor drowsiness with compact hardware. The employed system integrates additive-manufacturing for dry, user-generic earpieces, existing wireless electronics, and offline classification algorithms. Thirty-five hours of electrophysiological data were recorded across nine subjects performing drowsiness-inducing tasks. Three classifier models were trained with user-specific, leave-one-trial-out, and leave-one-user-out splits. The support-vector-machine classifier achieved an accuracy of 93.2% while evaluating users it has seen before and 93.3% when evaluating a never-before-seen user. These results demonstrate wireless, dry, user-generic earpieces used to classify drowsiness with comparable accuracies to existing state-of-the-art, wet electrode in-ear and scalp systems. Further, this work illustrates the feasibility of population-trained classification in future electrophysiological applications.

Subjects participated in multiple drowsiness trials to enable both user specific and user-generic training. Subjects were not familiar with the ear EEG work when selected. No more than five trials were recorded per subject to maintain a diverse data pool. Prior the trials, subjects were informed of the study purpose and requested to have a ‘normal night’ and not drink caffeine prior to the trial. Trials took place in a quiet, indoor office space between 8a.m. and 5p.m. when the lights were on. After donning the ear system, the subject was left alone in the trial space until the end of the recording session. During the trial, the subject would sit at a desk in front of a laptop with a custom GUI. Subjects were instructed to only perform the reaction game task and not look at personal devices for the extent of the trial. Subjects were allowed to move their heads, readjust in their seat, and move their arms, but were asked to stay seated during the entire session (to minimize motion artifacts). Each trial was 40–50 min in length and was self-ended by the subject to prevent the interruption of a drowsy event. At the end of the trial, the subjects removed the head band and earpieces themselves. They were instructed to wait at least 24 h before participating in subsequent drowsiness trials to maximize variation between trials

Wireless ear EEG systems offer a promising solution for real-time drowsiness detection, blending portability, comfort, and non-invasive monitoring with reliable performance.

These devices effectively capture brainwave patterns, such as alpha and theta activity, to identify drowsiness, with machine learning enhancing predictive accuracy. Their practicality addresses limitations of traditional EEG systems, making them suitable for applications in automotive safety, workplace health, and personal wellness. However, challenges like signal quality optimization, long-term comfort, and adaptability to individual variations remain. Future advancements in hardware design and signal processing will further refine these systems, unlocking their potential to enhance safety and well-being across diverse scenarios.

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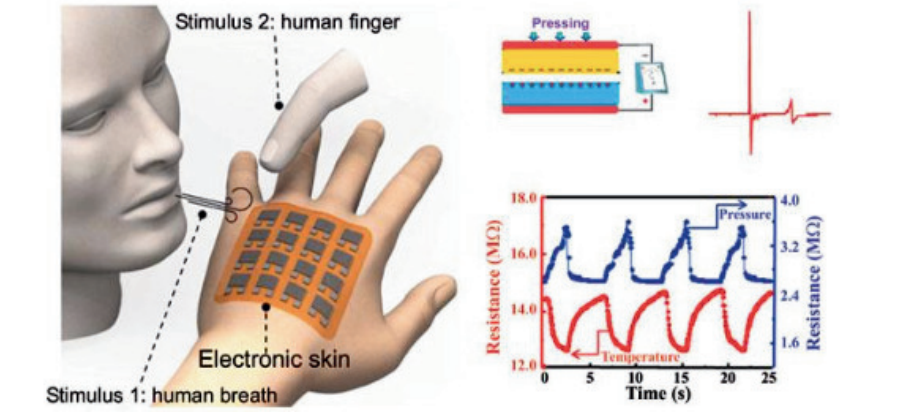
4.Electronic Skin

Human skin is an important organ. It consists of an integrated, stretchable network of sensors that relay information about tactile and thermal stimuli to the brain, allowing us to move the organs within our environment safely and effectively. It inspired by human skin an ELECTRONIC SKIN is created by artificial means used for autonomous intelligent robots and biometric prosthetics, among other applications. The development of electronic networks comprised of flexible, stretchable, and robust devices that are compatible with large-area implementation and integrated with multiple functionalities is a testament to the progress in developing an electronic skin (e-skin) to human skin. E-skins are already capable of providing augmented performance over their organic counterpart, both in superior spatial resolution and thermal sensitivity. They could be further improved through the incorporation of additional functionalities (e.g., chemical and biological sensing) and desired properties (e.g., biodegradability and self-powering).

Human skin is highly intuitive, making it easy to neglect the complexity of the largest sensory organ in our body, SKIN. Our skin is the physical barrier through which we interact with our surroundings. It allows us to perceive various shapes and textures, changes in temperature, and varying degrees of contact pressure. To achieve such high sophistication in its sensing capabilities, several different types of highly specialized sense receptors are embedded within our skin. These receptors first transducer information generated by physical contact into electrical signals and subsequently send it to the central nervous systems for more complex processing. The collected signals are eventually interpreted by the somato sensory cortex, permitting us to successfully navigate our physical world with ease.

The effort to create an artificial skin with human-like sensory capabilities is motivated by the possibility of such large, multisensory surfaces being highly applicable for autonomous artificial intelligence (e.g., robots), medical diagnostics, and replacement prosthetic devices capable of providing the same, if not better, level of sensory perception than the organic equivalent. Endowing robots with sensing capabilities could extend their range of applications to include highly interactive tasks, such as caring for the elderly, and sensor skins applied on or in the body could provide an



unprecedented level of diagnostic and monitoring capabilities. An artificial skin with such sensory capabilities is called as sensitive skin, smart skin, or electronic skin (e-skin).
Important functions of skin is to facilitate the sense of touch, which includes normal force sensing for grip optimization, tensile strain sensing for proprioception, shear force sensing for object manipulation, and vibration sensing for slip detection and texture analysis. While the commonly used transduction methods (such as piezoresistive, capacitive, piezoelectric, optical, and wireless) are readily available, advancements in device structures and materials have produced dramatic improvements in tactile sensor performance. For example, improvements in processes to create microstructured and nanostructured materials have presented exciting opportunities for smaller devices suitable for high-density arrays with low power consumption and excellent performance. However, further optimization of materials and device configurations is still necessary. For example, the piezoresistive composites that are currently used in some integrated systems display viscoelasticity that may potentially be overcome using matrixfree structures of nanomaterials.

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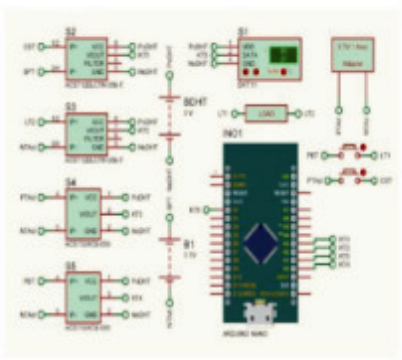
6.Enhancing Battery Management Systems For Sustainable Energy



Pin diagram of system.

The rapid growth of battery-powered applications, particularly in electric vehicles (EVs), has created an urgent need for more efficient and advanced Battery Management Systems (BMS). Lithium-ion (Li-ion) batteries, widely used in energy storage systems (ESS), play a vital role in ensuring operational efficiency and sustainability. One critical challenge in BMS technologies is accurately predicting the Remaining Useful Life (RUL) of batteries, which directly impacts performance, reliability, and cost-efficiency.

This study addresses these challenges by integrating real-time data collection and advanced predictive modeling. Sensors connected through an Internet of Things (IoT) device gather crucial parameters such as current, voltage, temperature, and cycle counts. This data is processed using Arduino Nano and serves as input for a Long Short-Term Memory (LSTM) model, specifically designed to predict battery RUL. The LSTM model is trained on the NASA Li-battery dataset and achieves a remarkably low root mean square error (RMSE) of 0.01173. This level of precision surpasses existing models, enhancing decision-making in BMS, particularly in resource allocation and adaptability to dynamic conditions..

Despite these achievements, challenges remain in implementing scalable, real-time data acquisition systems across diverse environments. Future research will focus on enhancing the model's generalizability, expanding its applicability to broader datasets, and automating data ingestion to reduce integration complexities. These developments aim to improve energy efficiency and sustainability, aligning with the United Nations Sustainable Development Goals (SDGs).

By addressing the limitations of current BMS technologies and proposing innovative solutions, this research contributes to the advancement of sustainable energy storage systems. The integration of IoT, predictive modeling, and real-time analytics paves the way for a more energy-efficient future, ensuring that battery-powered applications meet the growing demands of modern technology.

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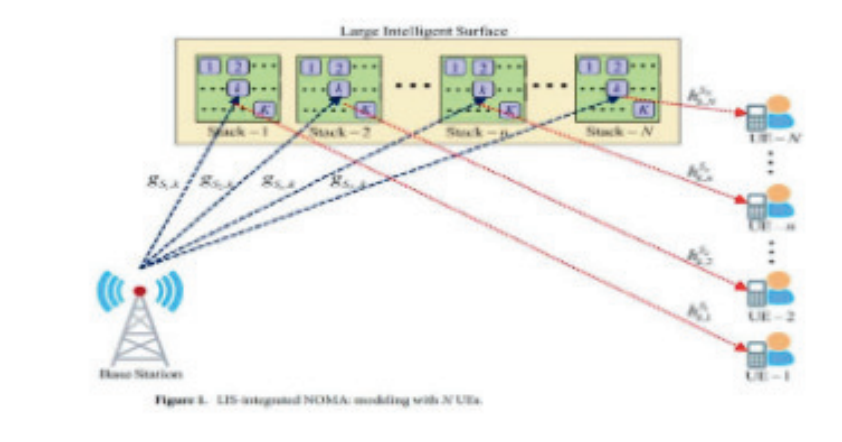
7.Enhancing Wireless Networks with LIS-Assisted NOMA: A New Era of Communication



The integration of large intelligent surfaces (LIS) with non-orthogonal multiple access (NOMA) networks is paving the way for advanced wireless communication systems with improved capacity and coverage. This study investigates the performance of LIS-assisted NOMA networks, proposing a novel system model to explore its potential.

The model features a base station (BS) equipped with an LIS to serve multiple users simultaneously. The LIS comprises numerous passive elements capable of adjusting reflection coefficients, thereby optimizing the wireless channel. In a downlink scenario, the BS transmits to multiple users via NOMA, while the LIS enhances signal quality and coverage.

The study highlights the efficiency of LIS-assisted NOMA networks compared to conventional NOMA systems that do not incorporate LIS. Results show that the LIS significantly improves system performance in various aspects, including:

Diversity Gain: Enhanced signal reliability under varying channel conditions.

Probability of Error: Reduction in transmission errors due to optimized channel environments.

Pairwise Error Probability (PEP): Lower error rates in distinguishing signals from different users.

These findings confirm the superiority of LIS-assisted NOMA networks, showcasing their potential to revolutionize wireless communication systems. By leveraging LIS, operators can achieve better network coverage, increased user capacity, and improved energy efficiency.

This research offers critical insights for the wireless community, providing a foundation for further exploration into LIS-NOMA integration. With its promising results, this approach inspires future developments in wireless technologies, bringing us closer to smarter, more efficient communication systems.

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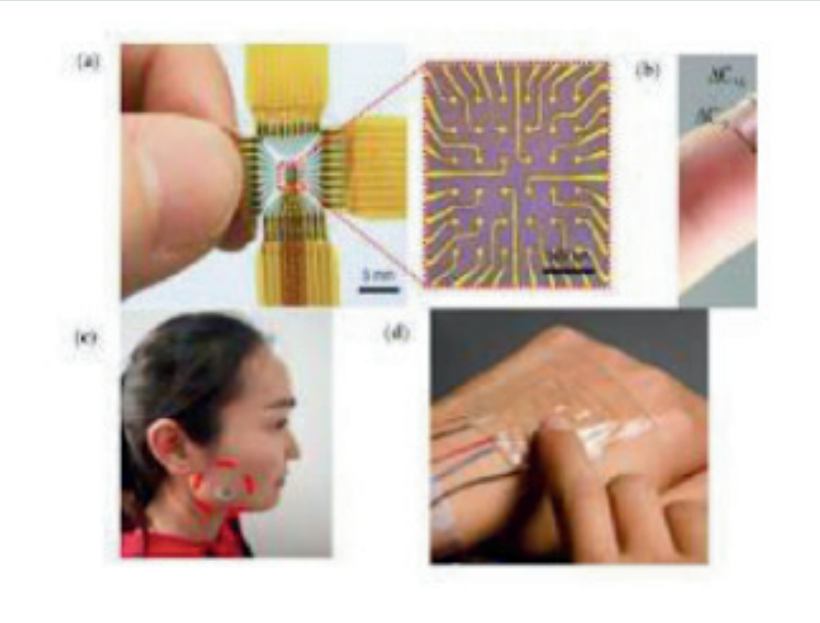
8.Flexible Electronics: The Future of Wearable Health Devices Revolutionizing Personal Healthcare with Smart, Biocompatible Materials



The world of wearable technology is rapidly evolving, and one of the most exciting advancements is the emergence of flexible electronics. These innovative materials, capable of bending, stretching, and conforming to the human body, are poised to revolutionize the field of personal healthcare. By seamlessly integrating with our skin and clothing, flexible electronics promise to deliver a new era of continuous, unobtrusive health monitoring and personalized care. This article delves into the unique flexible electronics used in wearable health technologies, their applications, challenges, and the role of electronics engineers in making them more efficient and reliable.

What Are Flexible Electronics? Flexible electronics refer to electronic devices or circuits that can be bent, stretched, or flexed without losing functionality.

Key properties of flexible electronics that make them ideal for wearables include:

Stretch ability and Conformability: These materials can stretch and bend to conform to the human body, providing greater comfort.

Biocompatibility: Many flexible electronic materials are biocompatible, making them suitable for long-term skin contact without causing irritation.

Lightweight Design: Flexible electronics enable the creation of ultra-light wearables that don’t compromise on functionality, making them practical for continuous health monitoring.

Fig: Person wearing a flexible, skin-like electronic patch

Applications of Flexible Electronics in Wearable Health Devices

1.Continuous Vital Signs Monitoring: Flexible sensors can be embedded into wearable devices like patches, wristbands, or even clothing to monitor key health indicators such as heart rate, blood oxygen levels, electrocardiograms (ECG), skin temperature, and respiratory rates in real-time as shown in fig.

2. Smart Patches for Disease Detection: Flexible electronic patches can be worn on the skin to detect biomarkers indicative of various health conditions. For example, sweat sensors can measure glucose, dehydration levels, or electrolyte imbalances, providing early warnings for diabetes or kidney disease. Additionally, these patches can transmit data to healthcare providers or smartphones for immediate action.
3. Wearable Health Sensors for Sports and Fitness: Advanced fitness trackers are evolving with flexible electronics that can track detailed metrics like muscle fatigue, hydration levels, lactate levels, and even biomechanics.

Challenges in Flexible Electronics for Wearables

1. Energy Efficiency and Power Supply: Powering flexible devices remains one of the biggest hurdles. Conventional power sources, such as batteries, are typically rigid and bulky, making them impractical for flexible wearables.
2. Signal Integrity and Data Processing: Flexible electronics often face issues with signal integrity, as the materials may not always transmit electrical signals as reliably as traditional components.
3. Biocompatibility and Skin Interaction: While flexible electronics are increasingly biocompatible, the interaction between the wearable device and skin is complex. Prolonged use of wearables can cause skin irritation or allergic reactions.

The Role of Electronics Engineers in Advancing Flexible Wearables

1. Material Innovation: Electronics engineers are at the forefront of researching and developing new materials that are both stretchable and biocompatible, such as graphene, conductive polymers, and carbon nanotubes.
2. Integration of Sensors and Actuators: Engineers are responsible for designing and integrating sensors (such as temperature, humidity, motion, or bio-sensors) and actuators (for feedback or control) into flexible substrates.
3. Signal Processing and Data Analytics: Advanced signal processing algorithms are needed to ensure that data collected by wearables is accurate, reliable, and actionable. Engineers are designing algorithms that can process real-time data from wearables, enabling personalized health insights and predictive analytics.

In conclusion, Flexible electronics are rapidly transforming the world of wearable health devices, offering vast potential to improve personal healthcare management, prevent diseases, and enable continuous health monitoring. Electronics engineers play a pivotal role in this transformation, driving innovations that will make future wearable health devices more comfortable, efficient, and reliable. As the field of flexible electronics continues to evolve, it promises to usher in a new era of personalized healthcare, where individuals can monitor their health in real-time and take proactive steps to maintain well-being, all with the help of cutting-edge wearable technologies.

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9.PCB Assembly

An Introduction to PCB Assembly

Printed Circuit Board (PCB) assembly is a critical process in electronics manufacturing. It involves the integration of electronic components onto a PCB to create a functional electronic device. This article outlines the key aspects of PCB assembly, from the basics to advanced considerations.

What is PCB Assembly?

PCB assembly refers to the process of mounting and soldering components such as resistors, capacitors, integrated circuits (ICs), and connectors onto a bare PCB. The result is a fully functional circuit that serves as the foundation for electronic products ranging from smartphones to industrial equipment.

PCB Assembly Process

The PCB assembly process involves several stages:

1. Solder Paste Application

A stencil is used to apply solder paste to the pads where components will be placed. The solder paste contains tiny solder balls suspended in a flux medium, which helps in soldering.

2. Component Placement

Automated machines, called pick-and-place machines, precisely position components onto the PCB.

These machines are programmed to handle components of various sizes and shapes with high speed and accuracy.

3. Soldering

Reflow Soldering: For Surface Mount Technology (SMT) components, the PCB is passed through a reflow oven. The heat melts the solder, creating a strong electrical and mechanical bond.

Wave Soldering: Used for Through-Hole Technology (THT) components, this process involves passing the PCB over a wave of molten solder.

4. Inspection and Testing

Inspection techniques such as Automated Optical Inspection (AOI) and X-ray inspection ensure the quality of solder joints and component placement. Functional testing verifies that the assembled PCB operates as intended.

5. Rework and Repair
If defects are found, the PCBs undergo rework or repair to correct issues, ensuring a high-quality final product.

Types of PCB Assembly

PCB assembly is classified based on the type of components and techniques used:
Surface Mount Technology (SMT): Components are mounted directly onto the PCB surface.
Through-Hole Technology (THT): Components are inserted into holes drilled in the PCB and soldered from the opposite side.
Mixed Technology: Combines SMT and THT for complex designs.
Advanced Considerations
Design for Manufacturability (DFM): Ensuring the PCB design is optimized for efficient and cost-effective assembly.
Material Selection: Choosing the right PCB material and components to meet performance and environmental requirements.
Quality Control: Implementing stringent checks to maintain reliability and compliance with industry standards.
Conclusion
PCB assembly is the backbone of modern electronics manufacturing. By combining precision, automation, and quality assurance, manufacturers produce reliable and high-performing electronic devices. Whether for consumer gadgets or industrial systems, the principles of PCB assembly remain vital to technological advancement.

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10. Proof Of Concept For A New Sensor To Monitor Marine Litter From Space

Worldwide, governments are implementing strategies to combat marine litter. However, their effectiveness is largely unknown because we lack tools to systematically monitor marine litter over broad spatio-temporal scales. Metre-sized aggregations of floating debris generated by sea-surface convergence lines have been reported as a reliable target for detection from satellites. Satellite detections are sufficient to map hot-spots and capture trends, providing an unprecedented source-to-sink view of the marine litter phenomenon. Torrential rains largely control marine litter inputs, while coastal boundary currents and wind-driven surface sweep arise as key drivers for its distribution over the ocean. Satellite-based monitoring proves to be a real game changer for marine litter research and management.

Marine litter (ML) mirrors the failures of our civilization to manage waste. In a few decades, ML has grown into a global environmental threat, recognised as an urgent priority on international sustainability agendas.ML is any human-made item that ends up in marine environments. The first global maps of plastic debris became available for the ocean surface a decade ago.Satellite-based observations are one of the best hopes for large-scale monitoring of ML. Yet, the fraction of ocean surface physically covered by plastic in the most polluted regions is estimated to be below 0.02%, from 200 to 0.1 parts per million. The weakness of the radiative signal reflected by the main component of ML imposes strong constraints for its direct monitoring from space, at least following the standard approaches used for other ocean constituents such as phytoplankton or suspended sediments. The objective of the present study is twofold. First, it aims to define an optimal Earth-Observation (EO) mission concept for the global-scale monitoring of ML, referred to as the EO4ML mission. Second, the study conducts a proof of concept to test the feasibility and usefulness of EO4ML by implementing it with available technology on a real-world case study. On the basis of the optimal EO concept, we derived a detector for use with the multispectral acquisitions of the in-orbit Copernicus Sentinel-2 sensor. This suboptimal detector was applied on a continuous basis throughout the Mediterranean Sea, selected as our region of interest for its notable socio-ecological value and high ML pollution.
Plastic materials have an unequivocal human origin and are predominant among floating ML. Therefore, the definition of the optimal mission concept for surface ML monitoring used plastic debris as the core target. In the first step, reflectance spectra were obtained for varying concentrations and plastic polymers, then incorporating then other materials relevant to the radiative signal of floating litter. This spectral library was fed into an atmospheric radiative transfer model in order to determine spectral radiances at the top of the atmosphere.

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11.The Evolution and Functionality of Smartphone Camera Modules

Smartphone camera modules have become marvels of modern engineering, transforming our mobile devices into powerful tools for capturing stunning images and videos. These compact systems integrate several components, including lenses, image sensors, and image signal processors (ISP), all designed to fit within the limited space of a smartphone.

How Does a Camera Module Work in a Smartphone? The journey of capturing an image begins when light enters through the lens and is focused onto the image sensor. This sensor converts the light into electrical signals, which the ISP then processes, applying various adjustments and enhancements to create the final digital image. Features like Optical Image Stabilization (OIS), autofocus, and flash further enhance the quality of photos and videos, ensuring that even in challenging conditions, the results are impressive.

Impact of Camera Module on Image Quality, The quality of a camera module significantly impacts the overall image quality. Several factors contribute to this, including sensor size, lens quality, aperture, and the performance of software algorithms. Larger sensors are capable of capturing more light, which is particularly beneficial in low-light conditions. High-quality lenses reduce distortion and aberrations, while advanced image processing techniques improve clarity, color accuracy, and dynamic range. Megapixels also play a crucial role; a higher megapixel count means more detailed images, which is especially useful for large prints and zooming in without losing clarity.

Front and Rear Camera Modules: Key Differences Front and rear camera modules differ in their design and functionality. Front cameras, often referred to as selfie cameras, are optimized for capturing self-portraits and video calls. They typically have simpler components and are designed to fit within the constraints of the smartphone's front design, often embedded within the display or placed in notches. Rear cameras, on the other hand, are designed for more advanced photography. They often include multiple lenses, such as wide-angle, telephoto, and macro lenses, to provide a
range of photographic effects and capabilities. Features like OIS and advanced autofocus systems are more commonly found in rear cameras, enhancing their ability to capture high-quality images in various conditions. The Evolution of Smartphone Camera Modules The evolution of smartphone camera modules has been driven by the demand for better image quality and more versatile photography options. As technology advances, manufacturers continue to push the boundaries, incorporating new features and improving existing ones. This has led to significant improvements in low-light performance, zoom capabilities, and overall image quality. The integration of artificial intelligence (AI) has also played a role, with AI algorithms helping to optimize settings, recognize scenes, and apply real-time enhancements.

Future Trends and Innovations Looking ahead, the future of smartphone camera modules appears even more promising. Emerging technologies such as computational photography, periscope lenses for enhanced zoom capabilities, and even more sophisticated AI algorithms are set to revolutionize mobile photography further. These advancements will not only enhance image quality but also open up new creative possibilities for users. In conclusion, the camera module in a smartphone is a complex and sophisticated system that plays a crucial role in the device's overall functionality. From capturing everyday moments to enabling professional-grade photography, these modules have revolutionized the way we use our smartphones. As technology continues to evolve, we can expect even more impressive capabilities from these tiny yet powerful components, further enhancing our ability to capture and share the world around us.

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12.Cybersecurity in Communication Systems

In today’s interconnected world, the importance of cybersecurity in communication systems cannot be overdrawn. With the increase in the digital communication technologies, including the internet, mobile networks, and wireless communication systems, securing the infrastructure that supports these networks has become crucial. Global connectivity relies on communication systems to enable real-time information sharing over long distances. However, this continuous flow of data also makes these systems vulnerable to cyber threats, ranging from data breaches and cyber attacks to spying and fraud. Given the growing number of malicious actors targeting communication networks in an attempt to take advantage of their vulnerabilities, it is more crucial than ever to implement strong cybersecurity measures.
The Growing Threat to Communication Systems:

Communication systems, whether for business, government, or personal use, are prime targets for cybercriminals. As more devices connect to the internet and become part of Internet of Things (IoT), the potential vulnerabilities increase. A compromised device can give hackers access to networks, steal sensitive data, or disrupt services. Threats range from DDoS attacks, which overwhelm servers, to more advanced man-in-the-middle (MITM) attacks, where attackers intercept and alter data in transit.
Securing communication systems is challenging due to the variety of technologies involved. Networks include mobile, satellite, and fiber-optic systems, each with unique security risks. For instance, public Wi-Fi networks in places like cafes and airports transmit data via radio signals, which attackers can intercept, risking sensitive information. To protect against these threats, encryption and secure connections are essential.

Securing Communication Systems: Methods and Technologies:

Encryption

Encryption secures communication by encoding data, ensuring it remains unreadable without the correct decryption key. This protects sensitive information during transmission, especially over public networks where interception risks are high. Protocols like SSL and TLS encrypt communication channels, safeguarding passwords, financial details, and other critical data from unauthorized access.

Authentication

Authentication prevents unauthorized access by verifying the identity of users and devices before allowing them into the network. Multi-factor authentication (MFA) strengthens this process by requiring multiple forms of verification, such as passwords combined with biometrics or one-time codes, making it harder for attackers to misuse stolen credentials.

Network Monitoring and Intrusion Detection Systems (IDS)

IDS and network monitoring tools continuously analyze traffic to detect unusual patterns that could indicate cyber threats. They help identify suspicious activities, such as abnormal login attempts or large data transfers, and can alert administrators or automatically block harmful traffic to secure the system against attacks.

Securing communication systems also entails teaching stakeholders and users about cybersecurity best practices and risks in addition to these technical fixes. A lot of successful cyberattacks take advantage of human error, like using weak passwords or clicking on malicious links in emails. Organizations can lessen the chance of attacks by educating employees about safe practices and cultivating a culture of cybersecurity awareness. Users and staff need to be taught how to spot phishing attempts, create strong, one-of-a-kind passwords, and appreciate the value of protecting their devices.

The Future of Cybersecurity in Communication Systems:

As communication systems continue to evolve, the threats targeting them grow increasingly sophisticated. The deployment of 5G networks and the proliferation of IoT devices expands the potential attack of cybercriminals, making the task of securing communication systems more complex. 5G, in particular, introduces new challenges related to network slicing, which allows for the creation of multiple virtual networks on a single physical infrastructure. While this enhances efficiency and customization, it also presents new security vulnerabilities that demand careful attention. Similarly,the integration of autonomous systems and artificial intelligence (AI) in communication networks introduces both opportunities and risks. AI can be used to enhance cybersecurity through advanced threat detection and automated responses, but it can also be leveraged by cybercriminals to carry out highly advanced and adaptive attacks.

The future of cybersecurity in communication systems will require greater collaboration between governments, private companies, and cybersecurity professionals. As cyber threats continue to evolve in complexity, security solutions must become more adaptive and interconnected, leveraging advanced technologies such as artificial intelligence (AI), blockchain, and quantum encryption. Blockchain, for example, can be used to ensure the integrity of data by creating tamper-proof records of transactions, making it much harder for attackers to manipulate communication data without being detected. Meanwhile, Quantum encryption offers virtually unbreakable encryption methods, paving the way for a transformative approach to transmitting and storing sensitive information.
In conclusion, safeguarding communication systems against cyber threats is an ongoing challenge that demands a multi-faceted approach. As technology advances and communication systems become more integral to every aspect of our lives, protecting these systems becomes more critical than ever. By implementing strong encryption, authentication, monitoring, and education programs, organizations can greatly mitigate the risk of cyberattacks. As the threat landscape continues to evolve, ongoing innovation and collaboration will be key to ensuring that communication systems remain secure, reliable, and resilient against emerging cyber threats.

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Research and Development: Academic Research
Number of publications during Academic Year 2022-2023

Year	Scopus Journals	International Journals	International Conference	National Conference	Total
2022 -23	13	13	06	--	32

List of publication by faculty in Scopus journal

Years	No. of Papers in Scopus Journals
2022-2023	13

List of Papers through Scopus Journals 2022-2023

Sl.no	Year	Title of the paper	Source Name
1	2022- 2023	Multi-data Multi-user End to End Encryption for Electronic Health Records Data Security in Cloud	B. S. Sahana Raj, Sridhar Venugopalachar, Wireless Personal Communications Volume -125, 2413–2441 (2022). https://doi.org/10.1007/s11277-022-09666-2
2	2022- 2023	Optimal Selection of Materials For High Performance of Carbon-Aerogel Supercapacitors	BiniBabu;H. Sathish Kumar;R. Manjunatha, S. S. ParthasarathyAIP Conference Proceedings Volume-2421, 050003 (2022)https://doi.org/10.1063/5.0076862
3	2022- 2023	Dynamic User Activity Prediction using Contextual Service Matching Mechanism	M. Subramanyam, S. S. Parthasarathy ,International Journal of Advanced Computer Science and Applications, Vol. 13, No. 3, 2022.
4	2022- 2023	A novel multimodal hand database for biometric authentication	Bharath M. R. and K. A. RadhakrishnaRao International Journal of Advanced Technology and Engineering Exploration, Vol 9(86) ISSN (Print): 2394-5443 ISSN (Online): 2394-7454 http://dx.doi.org/10.19101/IJATEE.2021.874525

5	2022- 2023	DAG block: Trust aware load balanced routing and lightweight authentication encryption in WSN	Revanesh, M., Acken, J.M., Sridhar, V.Future Generation Computer Systems, 2023, 140, pp. 402–421
6	2022- 2023	Deep learning-based algorithm for optimum cluster head selection in sustainable wireless communication system	Revanesh, M., Mary, S.A.S.A., Gnaneswari, G., ...Kanimozhi, K.V., Kamalam, G.K.Neural Computing and Applications, 2023
7	2022- 2023	An Optimized Question Classification Framework Using Dual-Channel Capsule Generative Adversarial Network and Atomic Orbital Search Algorithm	Revanesh, M., Rudra, B., Guddeti, R.M.R.IEEE , 2023, 11, pp. 75736–75747
8	2022- 2023	Energy Auditing and Broken Path Identification for Routing in Large-Scale Mobile Networks Using Machine Learning	Venu, N., Revanesh, M., Supriya, M., ...Isaac, L.D., Ferede, A.W.Wireless Communications and Mobile Computing, 2022, https://doi.org/10.1155/2022/9418172
9	2022- 2023	Artificial neural networks-based improved Levenberg–Marquardt neural network for energy efficiency and anomaly detection in WSN	Revanesh, M., Gundal, S.S., Arunkumar, J.R., ...Suhasini, S., Devi, T.K.Wireless Networks, 2023
10	2022- 2023	Hierarchical Block Chain-Based Authentication Management Scheme for IoT Devices	M. Revanesh, V. Sridhar Emerging Research in Computing, Information, Communication and Applications, 2022, Volume-790ISBN : 978-981-16-1341-8,https://doi.org/10.1007/978-981-16-1342-5_41

11	2022- 2023	Efficiently Revocable Identity-Based Broadcast Encryption Using Integer Matrices as Keys	Sahana Raj, B.S., Sridhar, V. Emerging Research in Computing, Information, Communication and Applications. Lecture Notes in Electrical Engineering, vol 789. Springer, Singapore. https://doi.org/10.1007/978-981-16-1338-8_38
12	2022- 2023	Generic Security Risk Profile of e-Governance Applications - a Case Study	B. S.Kumar, V.Sridhar, Sudhindra Kr ,Emerging Research in Computing, Information, Communication and Applications (pp.731-741) DOI:10.1007/978-981-16-1342-5_57, 2022.

International Journals

Year	International Journals
2022 -23	13

International journals 2022 – 2023

Sl. no	Author Name	Title of the paper	Journal Name/Volume/Year
1	Dr. Punith Kumar M B	Cotton Plant disease detection using Image Processing and Deep learning techniques: A Survey	International Conference on Electronics and Telecommunication for Real Time Applications (IETRTA 2022),ISBN No:978-93-5620-485-0 25th & 26th August 2022.
		Comparative Research of Neuron Circuits	International Journal for Research in Applied Science & Engineering Technology (IJRASET) ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538 Volume 10 Issue VII, July 2022
		Verification of Advanced Peripheral Bus Protocol (APB V2.0)	International Research Journal of Engineering and Technology (IRJET), Volume: 08 Issue: 06 , June 2022
		Smart Agricultural Marketing System	International Journal of Scientific Research in Engineering and Management (IJSREM)Volume: 07 Issue: 07 | July - 2023, ISSN: 2582-3930 pp. 1-6
		Technological Transformations: Harnessing Information Technology For Food Waste Management	International Research Journal of Modernization in Engineering Technology and Science, Volume:05/Issue:06/June-2023, ISSN: 2582-5208 pp.4340-4344

2	Dr. N M Mahesh gowda	Efficiency of DC-DC Switching Power Converter in CCM and SDCM of Operation	International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering (IJAREEIE), Impact Factor: 8.18 Volume 12, Issue 1, January 2023, DOI:10.15662/IJAREEIE.2022.1201008
		Sugarcane Disease Recognition Using Deep Learning	International Journal of Advanced Research in Science, Communication and Technology (IJARSCT)
		Medication Of Genes Using DNA Sequence With Machine Learning	International Journal of Science, Engineering and Technology
3	Mahesh Kumar A S	Performance analysis of Rheumatoid Arthritis using Convolutional Neural Networks	Neuro Quantology, September 2022, Volume 20 Issue 9 pp 2817-2826 doi: 10.14704/nq.2022.20.9.NQ44328
4	Vinay Kumar H S	Detection and Classification of Epilepsy Disease using Deep Learning Techniques applied to MR Images	International Journal on Electrical Engineering and Informatics
		Epilepsy detection and classification based on the contour maps of brain MR images	Int. J. Medical Engineering and Informatics, DOI: 10.1504/IJMEI.2022.10050095

5	Nischitha K	Authenticated E-DOC Using Live Location	International Journal of Scientific Research in Engineering and Management (IJSREM), Volume: 07 Issue: 06 , June-2023
		Close Buy: A Location-Based Mobile Application for Easy and Efficient Product Search and Purchase	Journal of Emerging Technologies and Innovative Research (JETIR), Volume 10, Issue 6, June 2023

List of Papers Published In International Conferences

Year	International Conference
2022 -23	06

International Conference 2022 – 2023

Sl. no.	Author Name	Title of the paper	Conference Name/Volume/Year
1	Dr. R Manjunatha	Optimal Selection of Materials For High Performance of Carbon-Aerogel Supercapacitors	2nd International Conference on Advanced Research in Mechanical Engineering (2nd ICARME – 22)
2	Dr. B S Nanda	Modeling and simulation of graphene field effect transistor (GFET)	Fourth International Conference on Emerging Research in Electronics, Computer Science and Technology (ICERECT)2022
3	Dr. B S Sahana Raj	Traitor Tracing in Broadcast Encryption using Vector Keys	2022 IEEE 2nd Mysore Sub Section International Conference (MysuruCon)

		A Survey on Healthcare Standards and Security Requirements for Electronic Health Records	Fourth Internation Conference on Emerging Research in Electronics, Computer Science and Technology-2022
4	Vinay Kumar H S	Cortical Thickness Analysis in the Cipher Domain for Epilepsy Status Determination	2023 International Conference on Network, Multimedia and Information Technology (NMITCON)
		Compact Optimal Representation of Cortical GyrusSulcus profile and subsequent Analysis for Epilepsy Severity and Forewarning	2022 IEEE 2nd Mysore Sub Section International Conference (MysuruCon)

Books Chapters Published

Sl. no	Name of the Author	Title of the Book	Publisher and year of publication	Role	Year
1	Dr. M J Anand Dr.Nagaranthna Dr.M.L. Anitha D M Srinivasa	2022 Fourth International Conference on Emerging Research in Electronics, Computer Science and Technology (ICERECT)	IEEE Explore DOI: 10.1109/ICERECT56837.2022	Editors	2022

Ph. D Awarded in the Years 2022-2023

Sl. no	Candidate	Ph.D/ M.ScEngg	University	Date of Award	Guide	Title
1	Sahana Raj B S	Ph.D	VTU	15th Feb 2023	Dr. V Sridhar	Study of health Monitoring System on IoT Platform using Biometric Crypto System and Its Performance Analysis

Best Projects:

Prize	Project title	Student USN	Name of the students	Name of the project guide
1st	Design and implementation of biometric controller	4PS19EC132 4PS19EC138 4PS19EC141 4PS19EC174	Saqib Ahmed Shreyas C S Shreyas RajR Yashwanth G P	Dr. Mahesh
2nd	Design and development of cognitive Routing unit	4PS19EC068 4PS19EC071 4PS19EC085 4PS19EC176	Kruthika M S Lakshmi M Monika K Deepika P B	M. Subramanyam

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