Staff Editorial

"You can make anything by writing"- C. S. Lewis. This quote emphasizes on writing whatever new things come to your mind. Writing has created worlds, gods, universes. You can create your own world by just writing it down and make an interest in the reader. Simple writing can just make an easy understanding to the readers.

I am thankful to all the valuable writers who have contributed their ideas to '**TechRadar**' section of Aayam magazine. I appreciate the efforts of the of our writers for writing such amazing articles on recent topics. Also our student editor Aakanksha Patil & Vaishnavi Phadtare who encouraged whi motivated our writers for the same. I would also sincerely thank our Head of Department Dr. A. A. Shinde for providing constant support in this magazine.

Hope this '**TechRadar**' will help you in knowing various technologies and their advantages in today's world.

Mrs. C. D. Rananaware

Assistant Professor

Student Editorial

The advancement in technologies has made human life easier and much efficient in many ways. Everyone should keep an update of upcoming new trends and revolutions in the world. So here we present 'TechRadar' to our readers for enhancing their knowledge in this section.

I appreciate the writers and thank them for contributing their knowledge in the technical section of Aayam. I would also thank Mrs. C. D. Rananaware for providing a helping hand and giving this opportunity. It will be definitely a great learning and reading experience.

Aakanksha Patil

Student Editor

Department		Writer's Name	Article Name
AI & DS	1.	Mayur Biradar	"Unleashing the Power of Generative Adversarial Networks: Understanding the Revolution in Deep Learning"
	2.	Om Vinayak Koli	Quantum Computing
	3.	Tejas Tekawade TE AI&DS	SPIKING NEURAL NETWORK
	4.	Durvesh Baharwal TE - AI&DS	The future of AI in healthcare and medicine
	5.	Shruti Ravindra Sancheti T.E(AI n DS)	Are digital tools making humans less or more productive?
Computer	6.	Mrs. N. S. Patil Assistant Professor	ChatGPT
	7.	Girish Navale Assistant Professor	SQL Injection
	8.	Sayali Jayant Joshi BE B	Blockchain
	9.	Aniruddha Nitin Karekar BE B	Hadoop
	10.	Manish Bharmare BE B	Cyber Security
E&TC	11.	Mrs. Archana S. Ubale Assistant Professor	"75 years of Sovereignty: A Technical Analysis of the development of the Semiconductor Industry in India"
	12.	Suprriya Lohar Assistant Professor	Earth's CO2 hits highest recorded level in human history
	13.	Debshika Dutta SE A	Artificial Neural Network
Electrical	14.	Samruddhi Chandgude SE	Technical Advancements in India
	15.	Omkar Sopan Lodhe TE	Last 75 years changes in Electricity
	16.	Shreeyash Bhosale & Komal Yadav BE	India's Economic Development
	17.	Shantanu Ghanwat BE	DRDO Development in last 65 years
FE	18.	Mr. A. J. More	3D Printing- The new era of manufacturing field
	19.	Dr. Amol Deshmukh & Dr. Pramod Mushrif	Renewable Energy Resources: An overview
	20.	Mr. Ashish S. Apate Assistant Professor	Computer Numerical Control (CNC)
	21.	Mr. A. H. Raheja	Soil Conservation

Instru	22.	Jijnyasa Joshi BE	Advanced Driver Assistance Systems (ADAS)
	23.	Sumeet Saibi BE	Embedded Systems & Security
	24.	Siddhi Sherkar BE	Space Technology
	25.	Vaishnavi Phadtare BE	Robotic Process Automation
	26.	Aakanksha Patil BE	Artificial Intelligence
	27.	Mrs. C. D. Rananaware Assistant Professor	LiDAR Technology
IT	28.	Pratiksha Rode TE	IBM & NASA to research impact of climate change with AI
	29.	Samruddhi Deore BE	Is Quantum Computing for real?
	30.	Shravani Shewale TE	How VR & AR are empowering healthcare industry.

"Unleashing the Power of Generative Adversarial Networks: Understanding the Revolution in Deep Learning"

Generative Adversarial Networks (GANs) are a class of deep learning algorithms that have gained immense popularity in recent years for their ability to generate new and realistic data from existing data. They consist of two parts: a generator network and a discriminator network. The generator network creates synthetic data, while the discriminator network tries to distinguish between real and synthetic data. The two networks are trained together in a competition, where the generator tries to generate data that is indistinguishable from real data, and the discriminator tries to correctly identify the synthetic data. As training progresses, the generator becomes more and more capable of generating realistic data, while the discriminator becomes better at identifying synthetic data. This competition between the two networks leads to an optimization process that results in both networks reaching an equilibrium, where the generator produces realistic synthetic data, and the discriminator is unable to distinguish between real and synthetic data. GANs have been used for a wide range of applications, including image synthesis, text generation, video generation, and audio generation. They have also been used for tasks such as super-resolution, style transfer, and data augmentation. One of the key strengths of GANs is their ability to generate high-quality synthetic data that is similar to real data. This is because the generator is trained on real data,

and thus has learned to generate data that is similar to the real data. The synthetic data generated by GANs can be used for a variety of purposes, including data augmentation, creating training data for other machine learning models, and generating new content for creative applications. However, GANs also have some limitations. One of the main challenges in training GANs is that they are prone to mode collapse, where the generator produces only a limited range of synthetic data. This can be addressed by using more advanced techniques, such as loss functions that encourage diversity in the generated data. Another limitation of GANs is that they are computationally expensive, and require a large amount of computing power and memory. Additionally, they can be difficult to train, and it can be challenging to find the right hyperparameters to ensure that the generator and discriminator reach an optimal equilibrium. In conclusion, GANs are a powerful and versatile class of deep learning algorithms that have the ability to generate high-quality synthetic data. While they have some limitations, they have shown great promise for a wide range of applications and have the potential to be used for even more exciting applications in the future.

Mayur Biradar [T.E (B)]

AI & DS

Quantum Computing

Quantum Computing is the rapidly evolving field, which works on the properties of quantum mechanics, to solve the problem beyond the reach of classical computers. Quantum mechanics is basically the science of very small, going all the way down to atoms and subatomic particles like electrons, protons, neutrons, alpha particle etc. Classical computers have limitations, whenever it needs to calculate a really large number or very large number of possibilities like in millions it is nearly impossible to calculate that with classical computer. But by studying the behavior of the subatomic particles, Quantum Computer(QC) can

solve complex problems that we would have never imagined. In this article we will look into basics of quantum computing, it's fundamental concepts, current applications and what future does it hold.

Quantum Computing dates back to 1980s, when physicists got the idea to use quantum system for performing computation. Over the years of research in Quantum Mechanics and technologies have paved our way in advancement in the field of Quantum Computing. QC basically works on three fundamental principles of quantum mechanics superposition, entanglement and interference.

Superposition: In QC we use qubits, which is quantum bit of the information, Unlike classical bit which can only be either 0 or 1, qubits can exists in multiple simultaneously, this phenomena is know as superposition.

Entanglement: The principle entanglement says that, the properties of two or more quantum particle can be correlated to one another such that state of one particle depend upon the state of other particle. This property of quantum physics allows QC's to perform calculation faster and efficiently.

Interference: As we studied in high school physics that particle are of dual nature, they behaving like particle and wave at the same time. Principle of interference states that the particle can interfere with each other causing their wave function to reinforce or cancel out each other. This property of particle helps us to solve problems like factorizing large number, which are impossible to solve with classical computer.

Applications:

Quantum Computing is the new field, but it has already found number of exciting application. For example QC have been used to simulate the nature of quantum system such

as molecules and material, which is beyond the reach of classical computers. It is also been used to tackle problems like travelling salesman problem, which have applications in field of logistic.

Now the main question is what future does the quantum computers hold, interestingly despite having problem in developing the quantum system the future of this field is bright, we have see advanced in technologies such error corrections and quantum memory. We can also expect to see development of new quantum algorithms.

Conclusion:

In conclusion, quantum computing is rapidly growing field with great potential. By using the properties of quantum physics like superposition, entanglement, and interference. Quantum Computer's(QC's) have potential to perform calculation faster and efficient than the classical computer. QC opens us up to the whole new world of possibilities human could ever imagine. As the field grows, quantum computing has the potential to play a vital role in transformation in the field of computer science and technology, from simulating complex quantum systems to solving challenging optimization problems.

Om Vinayak Koli

SPIKING NEURAL NETWORK

Spiking Neural Networks (SNNs) are a type of artificial neural network that simulate the behavior of biological neurons. They are based on the idea that neurons in the brain do not simply fire a constant output, but instead produce discrete spikes of activity in response to

input stimuli. Unlike traditional artificial neural networks, which use continuous activations, SNNs use spikes, or discrete events, to represent information.

SNNs are typically composed of a large number of simple processing units, known as neurons, which are connected by synapses. A neuron receives input from its synapses and generates an output spike based on that input. The timing and frequency of the output spikes convey information about the input. In addition to the spikes, SNNs also incorporate biological processes such as synaptic plasticity, which allows the strength of the connections between neurons to change based on the activity of the network.

The architecture of SNNs is similar to that of traditional artificial neural networks, but with some important differences. In SNNs, each neuron has a membrane potential that changes over time in response to incoming spikes. If the membrane potential exceeds a threshold, the neuron generates an output spike. The membrane potential is also influenced by an internal

time constant, which determines the time scale over which the neuron responds to incoming spikes.

SNNs have several advantages over traditional artificial neural networks. First, SNNs are more biologically plausible, as they more closely mimic the behavior of biological neurons. This makes them a good choice for applications that involve neural and brain-inspired systems, such as robotics and cognitive computing. Second, SNNs can be implemented efficiently in hardware, making them well-suited for low-power and real-time applications. Third, SNNs have the potential to be much more energy-efficient than traditional artificial neural networks, as they do not require constant computations to maintain the activations of neurons.

Despite these advantages, SNNs also has several limitations. One of the main challenges in training SNNs is that they require specialized algorithms and methods. For example, supervised learning algorithms for SNNs typically require a teacher signal that provides information about the desired output. This can make it difficult to train SNNs for complex tasks where the desired output is not well-defined.

Another challenge is that SNNs are typically not as accurate as traditional artificial neural networks. This is because they rely on the timing and frequency of spikes to represent information, which can be less precise than continuous activations. In addition, the

interpretation of SNNs can be difficult, as the information they contain is often not as easily accessible as it is in traditional artificial neural networks.

Despite these limitations, SNNs are an active area of research and have the potential to play a significant role in the development of next-generation artificial intelligence systems. Researchers are actively exploring new techniques for training SNNs, such as unsupervised and reinforcement learning, to overcome the limitations of supervised learning.

In conclusion, Spiking Neural Networks are a type of artificial neural network that simulate the behavior of biological neurons. They offer several advantages over traditional artificial neural networks, including greater biological plausibility, hardware efficiency, and energy efficiency. However, they also have several limitations, such as the need for specialized training algorithms and lower accuracy. Despite these limitations, SNNs are an exciting and rapidly evolving area of research with the potential to play a significant role in the development of next-generation artificial intelligence systems.

Tejas Tekawade

TE AI&DS

The future of AI in healthcare and medicine

Artificial Intelligence (AI) has been transforming the healthcare industry in numerous ways. From improving the accuracy of diagnoses to streamlining operations and reducing costs, AI has the potential to revolutionize the field of medicine. In this essay, we will discuss the future of AI in healthcare and medicine and how it will shape the way healthcare is delivered.

One of the key areas where AI will have a major impact is in the realm of diagnosis and treatment. With access to vast amounts of data, AI algorithms can help doctors and medical professionals make faster, more accurate diagnoses and recommendations for treatment. For instance, AI-powered systems can analyze medical images, such as X-rays, MRIs, and CT scans, to identify diseases and conditions that might have been missed by human physicians. This will enable doctors to provide more precise and effective treatment to patients, leading to better health outcomes.

Another important application of AI in healthcare is drug discovery and development. AI algorithms can be used to analyze large amounts of data, including genetic and biochemical data, to identify new targets for drug discovery and development. This will help to speed up the drug development process and increase the chances of successful outcomes. Additionally, AI can also be used to monitor the safety and efficacy of drugs once they have been approved, leading to improved patient outcomes and reduced healthcare costs.

In addition to its impact on diagnosis and treatment, AI will also play a major role in streamlining the healthcare system. For instance, AI algorithms can be used to automate routine tasks, such as appointment scheduling and data entry, freeing up medical staff to focus on more important tasks. Furthermore, AI systems can monitor patient health data, allowing for early detection of potential health problems, and ensuring that patients receive prompt and effective care. This will improve patient outcomes and reduce healthcare costs.

Another important area is where AI will play a major role in personalized medicine. With the help of AI algorithms, doctors will be able to tailor treatments to individual patients based on their unique genetic, biological, and lifestyle factors. This will allow for more effective and efficient treatments and will improve patient outcomes.

However, the integration of AI into healthcare has its challenges. One of the critical concerns is the privacy of patient data. As AI algorithms rely on large amounts of patient data to make accurate predictions and recommendations, it is important to ensure that this data is protected and that patients' privacy is not compromised. Additionally, there is a need to ensure that AI algorithms are transparent and accountable and that their decision-making processes are open to scrutiny.

Another challenge is the potential for AI to perpetuate existing biases in the healthcare system. For instance, AI algorithms that are trained on biased data may perpetuate these biases in their recommendations and predictions. To address these challenges, it is important to develop AI algorithms that are free from biases and that are trained on diverse and representative data sets.

In conclusion, the future of AI in healthcare and medicine is bright and holds great promise. From improving the accuracy of diagnoses to streamlining operations and reducing costs, AI has the potential to transform the way healthcare is delivered. However, to ensure that AI is used effectively and ethically in healthcare, it is important to address the challenges and

limitations of the technology. With continued investment and development, AI has the potential to improve the health and well-being of people around the world.

Durvesh Baharwal

TE - AI&DS

Are digital tools making humans less or more productive?

Yes, It is rightly said that digital tools make us more productive at work. But all this depends on how you use it. Technology can be both positive and negative as every coin has two sides. Digital technology makes it easy to stay in touch with friends, family, and work remotely, even if you are in another part of the world 24×7 without any barriers. You can express through words, video, audio, and exchange other media. Websites, apps, and software have all been designed to help users to socialize.

Technology Has Made Our Lives Far Easier and Better Through Better Communication and with great pace. The role of technology has successfully made the communication aspect much easier and better for us humans. Earlier we had to wait for the message for days and even, in some cases, for months but now 24×7 anytime anywhere we can communicate to anyone due to this evolution of technology. Turning over recurring and monotonous tasks to powerful computers increases productivity. It also reduces the chance of human error. Letting technology do the heavy lifting allows employees to focus on core business tasks and revenue-generating activities and motivates them to do more productive work.

Employees who work in digital workplaces are not only more productive but also more motivated, have higher job satisfaction, and report an overall better sense of well-being. Digital tools have important advantages for making processes more consistent, secure, efficient and effective in a timely manner. In addition to making our lives easier, it is also making us smarter. A new study found that people are more able to remember more and use more knowledge. For example, using the internet can improve your memory. Very important technological impact on education is increased interactivity and class engagement. In addition, better overall comprehension, practical learning, time management, and combined

learning methodologies are just some of the impacts that technology has had on student learning.

So, in short technology makes our life easy as well as convenient which help us to do more productive work thorough different digital tools. It is boon for humans.

Shruti Ravindra Sancheti

T.E(AI n DS)

ChatGPT

ChatGPT (chat generative pre-trained transformer) is a chatbot which launched by OpenAI in November 2022. On November 30, 2022, It was launched as a prototype and quickly grabbed attention for its detailed information and effective answers across many domains of knowledge.

What is Chat GPT?

Chat GPT is a generative language model. In real life it is understood as an artificial intelligence chat that has been trained and designed to hold natural conversations. It belongs to the research company OpenAI.

What is Chat GPT used for?

Following are some of the applications for which we can use Chat GPT :

1. For generation of logical,reasoning and well-written texts in a wide range of styles, topics and languages. News summaries, product descriptions or stories can be generated through it

2. Problems can be analyzed and solutions or answers to questions can be generated.

3. It can also be used to generate appropriate and consistent responses for a chatbot in a wide range of contexts.

4. It can also be used to generate attractive posts and messages for social networks.

5. With GPT we can generate reports, e-mails and other content for productivity applications.

6. Large data sets can be analyzed and valuable information can be extracted from them.

Advantages of Chat GPT:

1. Chat GPT is a powerful language model that can generate human like text and responses.

2. It can be used for wide range of applications so it is a useful tool for organizations of all sizes.

3. It can handle multiple languages making it useful tool for global communication.

4. It can process large amount of data quickly.

5. It can be integrated with other software and systems.

6. It can provide personalized responses based on user data.

7. It can operate 24/7 ,providing continuous support and assistance.

Disadvantages of Chat GPT:

1. It relies on data to learn and generate responses so it may not perform well in situations where it lacks relevant data.

2. It can lead to inacuurate results which can be frustrating for users.

3. It may not always provide accurate or appropriate responses.

4. It may not be able to understand or react to sarcasm, irony or other forms of communication.

5. It may not always provide the same level of empathy or emotional intelligence as a human which could negatively impact the user experience.

6. It may require ongoing maintenance and updates to ensure that it is performing best.

7. It may raise concerns about job displacement and impact on employment.

Will Chat GPT affect Education?

Chat GPT can be used as a teaching tool to assist students in learning and practicing their language abilities through conversational interactions with it. It will give personalized experience in education.

Chat GPT can be used as a research tool. It can assist researchers analyze and comprehend verbal interactions and language usage. Researchers can gain insights into how language is utilized and processed in regular conversation by analyzing the chatbot's responses and interactions with students.

But in other way Chat GPT may decrease face-to-face interaction between teachers and students. Students may not receive the same amount of personal engagement and assistance from a teacher if they rely on the chatbot for learning and feedback.

Conclusion:

Day by day technology is changing so we have to take advantage of technology but we should limit ourselves at one point. It should not stop our logical thinking ability. As it has it's own pros and cons, so we have to make use of this technology for our upgradation only.

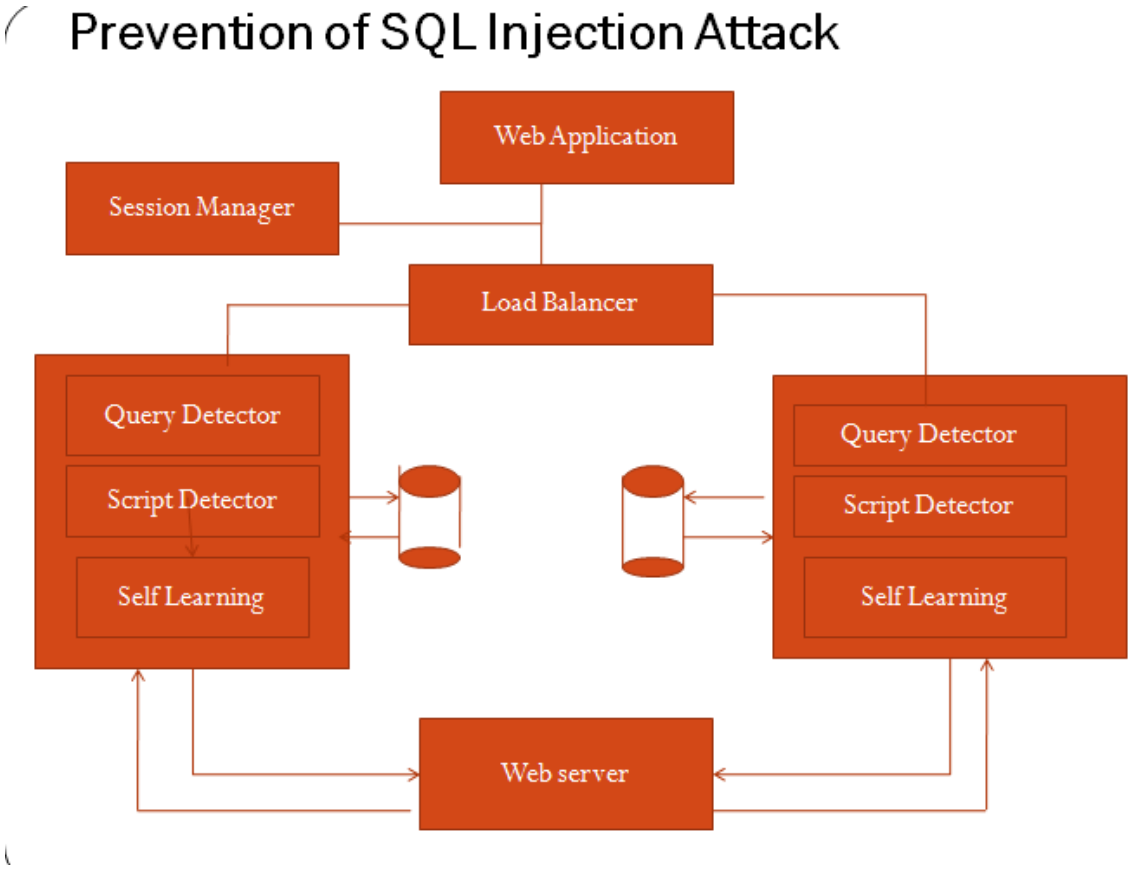
Mrs.N.S.Patil

Assistant Professor

SQL Injection

There are various attacks in internet. The attacker gain s the unauthorized access to the web based applications and performs data theft and modification to the database. SQL injection attacks are Mostly found on web based applications. The unauthorized user gain access to the system by creating sql queries that are totally different what the application needs. The social web sites like facebook, orkut ,twitter involves sql injection attacks where hacker gets the access of user accounts and involves changing the profile information passing vulgar messages to the friends.

The online bamking transaction involves sql injection attacks where transaction by where unauthorized user is done. The The username password and confidential information is leaked. The plugin tool is open source tool for detecting the sql injection and cross side scripting. It supports all kind of database and operating system.



The plugin system is useful for identifying the different sql injection attacks and diverted the attcks from altering the web application altered. This plugin systems accepts all supports all kind of databases Without modification in code. The identification and preventation of attack

is done automatically.There is no limitation of no of requests which can be tackled by plug-in tools and without much delay.

Girish Navale

Computer Department

Assistant Professor

Blockchain

What is Blockchain Technology?

Blockchain started in 1991 as a way to store and secure digital data. Blockchain is an open ledger that several parties can access at once. One of its primary benefits is that the recorded information is hard to change without an agreement from all parties involved. IBM explained that each new record becomes a block with a unique, identifying hash. Linking the blocks into a chain of records forms a blockchain. Bitcoin cryptocurrency uses blockchain technology.

Blockchain helps in the verification and traceability of multistep transactions needing verification and traceability. It can provide secure transactions, reduce compliance costs, and speed up data transfer processing. Blockchain technology can help contract management and audit the origin of a product. It also can be used in voting platforms and managing titles and deeds.

How Will Blockchain Disrupt Industries?

Here are the top 5 prominent industries that will be disrupted by blockchain technology in the near future:

1. Banking
2. Cyber Security
3. Supply Chain Management

4. Healthcare

5. Government

1. Banking

- Before Blockchain

o Banking has transfer fees, which can be both expensive and time-consuming for people. Also, sending money overseas becomes even more difficult due to the exchange rate and other hidden costs.

- After Blockchain

o Blockchain eliminates the need for a middleman. Blockchain is disrupting the banking system by providing a peer-to-peer payment system with the highest security and low fees.

o Blockchain technology provides instant and borderless payments across the globe

o Cryptocurrencies (like Ethereum, bitcoin) remove the requirement for a third party to perform transactions

o Blockchain records all the transactions in a public ledger which is globally accessible by bitcoin users

2. Cyber Security

- Before Blockchain

o Earlier, cyberattacks were a significant threat to the public. Several organizations were developing an effective solution to secure the data against unauthorized access and tampering.

- After Blockchain

o Blockchain quickly identifies malicious attack due to the peer-to-peer connections where data cannot be tampered with

o Every single piece of data stored on the blockchain network is verified and encrypted using a cryptographic algorithm

o By eliminating the centralized system, blockchain provides a transparent and secure way of recording transactions (without disclosing your private information to anyone)

3. Supply Chain Management

- Before Blockchain

o Due to the lack of transparency, supply chain management often had its challenges like service redundancy, lack of coordination between various departments, and lack of reliability.

- After Blockchain

o Tracking of a product can be done with blockchain technology, by facilitating traceability across the entire Supply chain.

o Blockchain gives the facility to verify and audit transactions by multiple supply chain partners involved in the supply chain management system.

o Blockchain records transaction (history, timestamp, date, etc.) of a product in a decentralized distributed ledger

o Each transaction is recorded into a block

o With blockchain, anyone can verify the authenticity or status of a product being delivered

4. Healthcare

- Before Blockchain

o In the healthcare system, patients can connect to other hospitals and collect their medical data immediately. Apart from the delay, there are high data corruption chances since the information is stored in a physical memory system.

- After Blockchain

o Blockchain removes a central authority, which results in instant access to dataHere, each block is linked to another block and distributed across the computer node. This becomes difficult for a hacker to corrupt the data.

Sayali Jayant Joshi [BE B]

Computer

Hadoop

Hadoop is an Apache open source framework written in java that allows distributed processing of large datasets across clusters of computers using simple programming models. The Hadoop framework application works in an environment that provides distributed storage and computation across clusters of computers. Hadoop is designed to scale up from single server to thousands of machines, each offering local computation and storage.

Hadoop Distributed File System

The Hadoop Distributed File System (HDFS) is based on the Google File System (GFS) and provides a distributed file system that is designed to run on commodity hardware. It has many similarities with existing distributed file systems. However, the differences from other distributed file systems are significant. It is highly fault-tolerant and is designed to be deployed on low-cost hardware. It provides high throughput access to application data and is suitable for applications having large datasets.

Apart from the above-mentioned two core components, Hadoop framework also includes the following two modules −

- Hadoop Common − These are Java libraries and utilities required by other Hadoop modules.
- Hadoop YARN − This is a framework for job scheduling and cluster resource management.

How Does Hadoop Work?

It is quite expensive to build bigger servers with heavy configurations that handle large scale processing, but as an alternative, you can tie together many commodity computers with single-CPU, as a single functional distributed system and practically, the clustered machines can read the dataset in parallel and provide a much higher throughput. Moreover, it is cheaper than one high-end server. So this is the first motivational factor behind using Hadoop that it runs across clustered and low-cost machines.

Hadoop runs code across a cluster of computers. This process includes the following core tasks that Hadoop performs −

- Data is initially divided into directories and files. Files are divided into uniform sized blocks of 128M and 64M (preferably 128M).
- These files are then distributed across various cluster nodes for further processing.
- HDFS, being on top of the local file system, supervises the processing.
- Blocks are replicated for handling hardware failure.
- Checking that the code was executed successfully.
- Performing the sort that takes place between the map and reduce stages.
- Sending the sorted data to a certain computer.
- Writing the debugging logs for each job.

Advantages of Hadoop

- Hadoop framework allows the user to quickly write and test distributed systems. It is efficient, and it automatic distributes the data and work across the machines and in turn, utilizes the underlying parallelism of the CPU cores.

- Hadoop does not rely on hardware to provide fault-tolerance and high availability (FTHA), rather Hadoop library itself has been designed to detect and handle failures at the application layer.
- Servers can be added or removed from the cluster dynamically and Hadoop continues to operate without interruption.
- Another big advantage of Hadoop is that apart from being open source, it is compatible on all the platforms since it is Java based.

Aniruddha Nitin Karekar [BE B]

Computer

Cyber Security

What is Cyber Security?

Cyber security is the practice of defending computers, servers, mobile devices, electronic systems, networks, and data from malicious attacks. It's also known as information technology security or electronic information security. The term applies in a variety of contexts, from business to mobile computing, and can be divided into a few common categories.

•Network security is the practice of securing a computer network from intruders, whether targeted attackers or opportunistic malware.

•Application security focuses on keeping software and devices free of threats. A compromised application could provide access to the data its designed to protect. Successful security begins in the design stage, well before a program or device is deployed.

•Information security protects the integrity and privacy of data, both in storage and in transit.

•Operational security includes the processes and decisions for handling and protecting data assets. The permissions users have when accessing a network and the procedures that determine how and where data may be stored or shared all fall under this umbrella.

•Disaster recovery and business continuity define how an organization responds to a cyber-security incident or any other event that causes the loss of operations or data. Disaster recovery policies dictate how the organization restores its operations and information to return to the same operating capacity as before the event. Business continuity is the plan the organization falls back on while trying to operate without certain resources.

•End-user education addresses the most unpredictable cyber-security factor: people. Anyone can accidentally introduce a virus to an otherwise secure system by failing to follow good security practices. Teaching users to delete suspicious email attachments, not plug in

unidentified USB drives, and various other important lessons is vital for the security of any organization.

Types of cyber threats

•The threats countered by cyber-security are three-fold:

•Cybercrime includes single actors or groups targeting systems for financial gain or to cause disruption.

•Cyber-attack often involves politically motivated information gathering.

•Cyberterrorism is intended to undermine electronic systems to cause panic or fear.

So, how do malicious actors gain control of computer systems? Here are some common methods used to threaten cyber-security:

•Malware

Malware means malicious software. One of the most common cyber threats, malware is software that a cybercriminal or hacker has created to disrupt or damage a legitimate user's computer. Often spread via an unsolicited email attachment or legitimate-looking download, malware may be used by cybercriminals to make money or in politically motivated cyber-attacks.

•There are a number of different types of malware, including:

· Virus: A self-replicating program that attaches itself to clean file and spreads throughout a computer system, infecting files with malicious code.

· Trojans: A type of malware that is disguised as legitimate software. Cybercriminals trick users into uploading Trojans onto their computer where they cause damage or collect data.

· Spyware: A program that secretly records what a user does, so that cybercriminals can make use of this information. For example, spyware could capture credit card details.

· Ransomware: Malware which locks down a user's files and data, with the threat of erasing it unless a ransom is paid.

· Adware: Advertising software which can be used to spread malware.

· Botnets:Networks of malware infected computers which cybercriminals use to perform tasks online without the user's permission.

Cyber safety tips - protect yourself against cyberattacks

•How can businesses and individuals guard against cyber threats? Here are our top cyber safety tips:

•Update your software and operating system:This means you benefit from the latest security patches.

•Use anti-virus software:Security solutions like Kaspersky Total Security will detect and removes threats. Keep your software updated for the best level of protection.

•Use strong passwords:Ensure your passwords are not easily guessable.

•Do not open email attachments from unknown senders:These could be infected with malware.

•Do not click on links in emails from unknown senders or unfamiliar websites:This is a common way that malware is spread.

•Avoid using unsecure WiFi networks in public places:Unsecure networks leave you vulnerable to man-in-the-middle attacks.

Manish Bhamare

BE B Computer

"75 Years of Sovereignty: A Technical Analysis of the Development of the Semiconductor Industry in India"

The semiconductor industry has been a key driver of economic growth in India over the past 75 years since the country gained independence. The industry has seen significant growth, driven by the growth of the Information Technology (IT) sector, increased foreign investment, and favorable government policies. Today, India is one of the fastest-growing semiconductor markets in the world, and is home to a number of major international semiconductor companies, as well as a growing domestic manufacturing sector.

The IT sector has been a major driver of growth in the Indian semiconductor industry. The rise of IT has led to increased demand for electronics and semiconductor products, such as personal computers, smart phones, and other electronic devices. This has created a large market for semiconductors, and has helped to drive investment into the industry.

In recent years, there has been a significant increase in foreign investment in the Indian semiconductor industry. Major international semiconductor companies, such as Intel, Samsung, and Texas Instruments, have established operations in the country, taking advantage of the favorable business environment, the growing market for electronics, and the availability of skilled labor. These companies have invested heavily in research and development, as well as in manufacturing, and have helped to drive the growth of the industry.

The government of India has also played an important role in promoting the growth of the semiconductor industry. In 2012, the government launched the National Policy on Electronics, which aimed to create a favorable environment for the electronics and semiconductor industries, and to encourage investment and growth. The policy includes a number of incentives and subsidies, such as tax holidays and subsidies for research and development, as well as investment in manufacturing facilities.

The government has also established the Electronics Development Fund, which provides funding for research and development in the electronics and semiconductor industries. This has helped to encourage innovation and investment in the sector, and has helped to drive growth. The government has also established a number of institutions to provide training and education in electronics and semiconductor technology, including the Indian Institute of Technology and the National Institute of Technology.

The growth of the semiconductor industry in India has had a significant impact on the country's economy. The industry has created a large number of jobs, and has helped to drive

economic growth. The industry is also an important source of exports, with a significant portion of the semiconductors produced in India being exported to other countries.

In terms of facts and figures, the Indian semiconductor market was valued at approximately $40 billion in 2020, and is expected to grow to over $100 billion by 2025. The compound annual growth rate of the market is expected to be more than 20% over the next few years. The industry employs over 300,000 people, and is expected to create an additional 200,000 jobs in the next five years.

To conclusion, the growth of the semiconductor industry in India has been a key driver of economic growth in the country over the past 75 years since independence. The industry has been driven by the growth of the IT sector, increased foreign investment, and favorable government policies, and has had a significant impact on the economy. The future of the industry looks bright, with continued growth expected in the coming years, driven by the growing demand for electronics and semiconductor products.

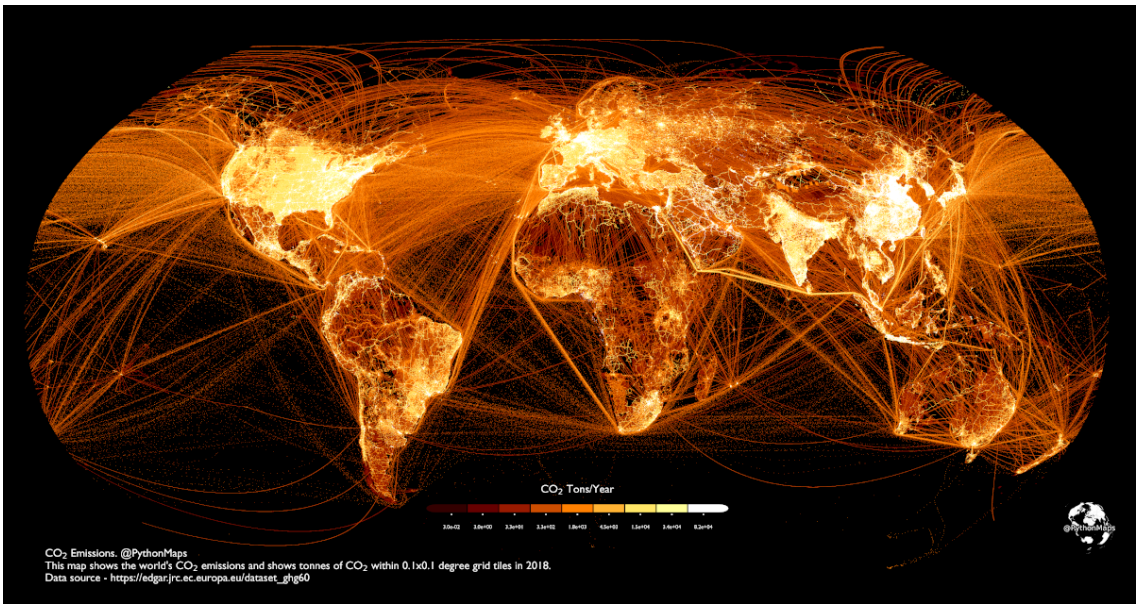
Mrs.Archana S. Ubale

Assistant Professor

E&TC Department

Earth’s CO2 hits highest recorded level in human history

Levels of carbon dioxide in the atmosphere reached the highest levels on record for any calendar month during April 2022, averaging 420 parts per million (ppm) for the first time since observations began in 1958, according to new data.



Why it matters: Carbon dioxide is a long-lived, planet-warming greenhouse gas, the concentration of which is increasing due to human activities, such as the burning fossil fuels like coal and natural gas for energy. Studies show current levels are higher than any time in as long as 4.5 million years.

The big picture: Increasing amounts of CO2 in the atmosphere are boosting global average temperatures. Climate change has been conclusively tied to the escalating impacts from climate change, including more extreme and frequent heat waves, heavy precipitation events, larger, more frequent wildfires and sea level rise.

- Studies have shown that only steep emissions cuts beginning this decade can bring down CO2 levels sufficiently in order to meet the temperature targets laid out in the Paris Climate Agreement.

Zoom in: The new data, which comes from the Scripps Institution of Oceanography, shows that April had a monthly average CO2 concentration of 420.02 ppm. This is up from 316 ppm at the start of the Mauna Loa record.

- The National Oceanic and Atmospheric Administration (NOAA) will report its new numbers tomorrow, but they are expected to closely match the Scripps readings. The annual peak typically occurs in May, prior to the Northern Hemisphere warm season when vegetation soaks up the gas.

- "It is likely May will be higher still," Pieter Tans, who tracks greenhouse gases for NOAA, told Axios.

What they're saying: Looking at his agency's data and the trends from year-to-year and decade-to-decade, Tans said it's difficult to see any progress being made in bringing levels of global warming pollutants down.

- "The world effectively has made no serious progress compared to what is required," Tans said. "We really need to focus on decreasing emissions and we haven't had much success globally because the rate of increase of CO_2 remains as high as it has been in the last decade."

- "Especially CO_2 has a longevity of hundreds to thousands of years, so we are really making a very long-term climate commitment," Tans said.

- Tans and other researchers told Axios that the sustained year-to-year growth rates in CO_2 concentrations are unprecedented. The 400 ppm mark was eclipsed less than a decade ago, in 2013, but CO_2 amounts have increased by more than 2 ppm each year.

The bottom line: Technologies exist that would provide clean electricity, such as using solar and wind energy. Government and private sector funding is funneling into electric vehicles and technology that is farther off in development, like direct air capture, which would take carbon directly out of the atmosphere.

- However, so far, countries including the U.S. have yet to show results when it comes to stepping up the pace and ambition of cutting CO_2 emissions.

Referances:

1.https://www.axios.com/2022/05/04/april-sets-record-highest-co2-levels.

2. https://www.axios.com/2022/05/04/april-sets-record-highest-co2-levels.

3.https://www.independent.co.uk/climate-change/news/carbon-dioxide-record-co2-b2072614.html.

Suprriya Lohar

Assistant Profesor

E & TC Department

Artificial Neural Network

We humans are indeed amazing. The brain of human and its working has always been blowing the minds. Inspired by the human brain, Artificial neural network, computational model, came into the existence. It is a biologically inspired network of artificial neurons configured to perform specific tasks. It is the one of the biggest advancement in the computing industry.

The term ‘Neural’ is derived from the word ‘neuron’, which is the basic function unit of present in the brain and other parts of the human body. A neural network is a group of algorithms that certify the underlying relationship in a set of data similar to the human brain. The neural network helps to change the input so that the network gives the best result without redesigning the output procedure.

Neural Networks resemble the human brain in the following two ways :

- A neural network acquires knowledge through learning.

- A neural network's knowledge is a store within inter-neuron connection strengths known as synaptic weights.

ANN Vs. VNN

- The Biological Neural Network's dendrites are analogous to the weighted inputs based on their synaptic interconnection in it.

- The cell body is comparable to the artificial neuron unit in it, comprising summation and threshold unit.

- Axon carries output that is analogous to the output unit in the case of it. So, it is model using the working of basic biological neurons.

Working:

- It can be viewed as weighted directed graphs in which artificial neurons are nodes, and directed edges with weights are connections between neuron outputs and neuron inputs.

- The Artificial Neural Network receives information from the external world in pattern and image in vector form. These inputs are designated by the notation x(n) for n number of inputs.

- Each input is multiplied by its corresponding weights. Weights are the information used by the neural network to solve a problem. Typically weight represents the strength of the interconnection between neurons inside the

Neural Network.

- The weighted inputs are all summed up inside the computing unit (artificial neuron). In case the weighted sum is zero, bias is added to make the output notzero or to scale up the system response. Bias has the weight and input always equal to ‘1'.

- The sum corresponds to any numerical value ranging from 0 to infinity. To limit the response to arrive at the desired value, the threshold value is set up. For this, the sum is forward through an activation function.

- The activation function is set to the transfer function to get the desired output. There are linear as well as the nonlinear activation function.There are several types of ANNs, including feed forward networks, recurrent networks, and convolutional neural networks. Large datasets and optimization algorithms such as gradient descent. The goal of training is to adjust the weights of the connections between the artificial neurons so that the network can make accurate predictions on new, unseen data .Few of the applications of ANNs are image and speech recognition, natural language processing, and recommendation systems.

ANNs have become a powerful tool for solving complex problems in various fields. With time and lots of research and development ANNs is continuing to advance even more.

Debshika Dutta

SE ENTC-A

Technical Advancements in India

India has seen many technological advancements since its Independence. It has strongly created its identity as a fast-developing nation. The people in India are known for their scientific rigour and potential all across the world. It is because of the strong will of we Indians that we have experienced so much development. Even in the medieval period, India was known for the development of education through large-scale historical universities like “Nalanda” and “Takshashila”. The science of medicine and ayurveda were also given by India. It has not only helped in the development of its own but also helped in the development of the world.

India gained its pace in scientific discovery after Independence. Getting back the reigns of democracy and planning the years to regain our prosperity encouraged people to work towards scientific and technological advancements. In all these years, India witnessed a massive shift in these fields of discovery by strategically aligning its skills and resources. let's see the technological advancements in India throughout the decades.

1947 – 1957

Establishment of a Five-Year plan which prioritized scientific research:

The Planning Commission in India was set up in 1950 to ideate and plan the actions to be taken in key sectors such as agriculture, science, infrastructure, and education. The first-ever plan draft was presented in July 1951 and had a dedicated chapter on “Scientific and Industrial Research”. Being the first plan, it prioritized laying the foundation of scientific research in the country and largely focused on initiatives for building or enhancing national laboratories and research centres:

It recognized eleven research institutes at the national level and stressed their importance in the development of the country’s future. These included the National Physical Laboratory of India (Delhi), National Chemical Laboratory (Pune, Maharashtra), and Central Electrochemical Research Institute (Karaikudi, Tamil Nadu) among others.

Some of these institutes only had nucleus units and needed more investment for their expansion. The plan provided for the completion of buildings and installation of the necessary equipment to enable the laboratories to function fully.

It also proposed the setting up of three new institutes: Radio and Electronics Research Institute; Mechanical Engineering Research Institute; Central Salt Research Station.

1957 – 1967

Focus on agricultural research and the emergence of the Green Revolution.

After independence, regaining control of agriculture production was a task. Research about the crop yield potential of locations across the country, irrigation systems, effective fertilizers, pesticides, power sources, and agricultural equipment was lacking. The government prioritized scientific research for advancing agriculture. This led to the Green Revolution during this decade. This enabled India's agrarian economy, which was on the brink of collapse in 1947, to improve steadily. This revolution made us self-reliant, as we travelled the distance from being an importer of food grains to one producing it in surplus.

1967 – 1977

Aryabhata – India's first satellite

India's contribution to the science of space is immense. The Indian Space Research Organization (ISRO) was established in 1969 to serve as India's national space agency. The first-ever Indian satellite was the 'Aryabhata', which was designed and manufactured in India and was launched on 19th April 1975. ISRO developed Aryabhata to execute X-ray astronomy, aeronomy and solar physics.

1977 – 1987

AGNI – India's strategic missile

India successfully developed strategic missile systems in the 1980s, with the successful testing of Agni in 1989. Eventually, Indian scientists were able to demonstrate abilities such as re-entry, manoeuvring range, control, guidance, two-stage propulsion and stage separation. Since then, India has created, tested, and operationalized several missile systems. The Agni became a series of missiles, with the latest one being Agni-V, successfully tested in 2018.

1987 – 1997

DNA fingerprinting

DNA fingerprinting in India came into existence in 1988 when the Council of Scientific and Industrial Research–Centre for Cellular and Molecular Biology (CSIR–CCMB) scientists developed the technique and made it available for use, making India the third country to develop its DNA fingerprinting probe.

1997– 2007

Pokhran-II nuclear test

On 11th May 1998, India successfully tested five nuclear bombs underground in Pokhran, Rajasthan—these tests were titled ‘Pokhran-II’.

To facilitate the technological achievement of an emerging democracy, this day was named ‘National Technology Day’. By our then Prime Minister Shri Atal Bihari Vajpayee. It is observed each year.

2007 – 2017

Chandrayaan-I mission to the moon

Chandrayaan-I was India’s first-ever mission to the moon, launched on 22nd October 2008 from Sriharikota, Andhra Pradesh. The spacecraft hovered around the moon to deliver chemical, photo geologic, and mineralogical mapping to ISRO.

Polio-free India

India accounted for around 60% of the global cases of polio in 1994. A dedicated campaign to vaccinate every child the Government enabled us to become polio-free within two decades. India received the ‘Polio-free’ certification from World Health Organization (WHO) on 27th March 2014.

This immunization drive was a success because of strong policy, committed healthcare professionals, and front-line and community workers. A large part of this campaign was the education of those hesitant to get vaccinated in backward and rural areas of the country, by increasing awareness about its safety and benefits.

Mars Orbiter Mission (MOM) (also known as Mangalyaan)

A historic first for India—its first-ever interplanetary mission. MOM marked India’s place in the field of space exploration. Launched on 5th November 2013, MOM studied Mar’s topography, morphology, mineralogy and atmosphere. Apart from scientific breakthroughs, MOM is also lauded for its cost-effectiveness.

Encouragement of start-ups

The Government launched the ‘Startup India’ program’ on 16th January 2016 to develop an ecosystem to encourage indigenous scientific, technological and innovative development in

India. Since then, the number of Indian startups has increased and is growing. As of July 2021, there are more than 52,000 start-ups in the country, making India one of the largest start-up ecosystems in the world. These start-ups have resulted in the creation of more than 5 lakh jobs. The top ten sectors for start-ups in India are IT services, healthcare & life sciences, education, professional & commercial services, food & beverages, agriculture, finance technology, technology hardware, construction and green technology.

2017 – Present

ISRO's Gaganyaan Programme

The Gaganyaan Programme is designed to demonstrate human spaceflight to Low Earth Orbit (LEO) (as per NASA, LEO is considered to be the area in Earth's orbit that is near enough to Earth for convenient transportation, communication, observation and resupply; this is the area where the 'International Space Station currently orbits). This programme is expected to set the stage for efficient and effective Indian human space exploration in future. Two unmanned missions and one manned mission have been approved by the Government under the Gaganyaan Programme.

During his Mann ki Baat address in 2020, Prime Minister Narendra Modi shared his views on the Gaganyaan Programme, stating it to be the nation's first step towards establishing a sustained Indian human space exploration program. This mission is expected to provide India with the opportunity to collaborate with global space station development, along with employment generation for a scientifically thriving younger population.

COVID-19 vaccine research and vaccination drive

India was at the forefront of vaccine development research, eventually becoming one of the largest manufacturers and exporters of COVID-19 vaccines. As of end-2021, we have supplied over 7 Crore COVID-19 vaccine doses to more than 90 countries.

Further, the scale of India's vaccination drive has been unprecedented. As of February 2022, more than 170 crore vaccination doses have been administered.

As we continue to evolve and innovate, the aim is to maintain the pace of development in science and technology, along with ensuring global recognition and exposure.

Samruddhi Chandgude

SE Electrical

Last 75 Year Changes In Electricity

Over the last 75 years, the world has seen a tremendous transformation in the way electricity is produced, distributed, and consumed. The advances in technology and the development of new energy sources have led to significant improvements in the efficiency and accessibility of electricity. In addition, various government acts and policies have also played a critical role in shaping the electricity sector. In this article, we will discuss some of the significant changes that have occurred in the electricity sector over the last 75 years, along with some key acts that have influenced these changes.

One of the most motable changes in the electricity sector over the last 75 years has been the shift towards renewable energy sources. The growing concern about climate change and the environmental impact of fossil fuels has led to a significant increase in the use of renewable energy sources such as solar, wind, and hydropower. This shift towards clean energy has been driven by technological advancements and the implementation of government policies that provide incentives for the use of renewable energy.

Another significant change in the electricity sector has been the decentralization of power generation. In the past, power was primarily generated by large centralized power plants, but today, there is a growing trend towards decentralized power generation, where individuals and communities generate their own electricity using solar panels or wind turbines. This shift has been facilitated by improvements in technology and changes in government policies.

Several acts have played a critical role in shaping the electricity sector over the last 75 years. One of the most important acts was the Energy Policy and Conservation Act of 1975, which established the strategic petroleum reserve and set fuel economy standards for

cars and trucks. This act played a vital role in reducing the country's dependence on foreign oil and promoting energy efficiency.

The energy policy act of 2005 was another critical act that had a significant impact on the electricity sector. This act provided incentives for the development and use of renewable energy sources, promoted the use of energy-efficient technologies, and established a renewable energy portfolio standard that required a certain percentage of electricity to be generated from renewable sources.

In conclusion, the electricity sector has undergone significant changes over the last 75 years, driven by technological advancements and changes in government policies. The shift towards renewable energy sources and the decentralization of power generation are some of the most significant changes that have occurred. The energy policy and conservation act of 1975 and the energy policy act of 2005 are some of the key acts that have played a crucial role in shaping the electricity sector. As the world continues to grapple with climate change and energy security, it is likely that the electricity sector will continue to undergo significant changes in the coming years.

OMKAR SOPAN LODHE

(T.E ELECTRICAL)

India’s Economic Development

India has a long and rich history of economic development, dating back to ancient times when it was known for its trade and commerce with countries like Rome and China. During the colonial period, India was an agricultural economy, with a large portion of its population engaged in farming. After independence in 1947, India adopted a planned approach to

development, with a focus on building heavy in industries and infrastructure. This resulted in a period of high economic growth in the 1960's and 1970's followed by a period of slow growth in the 1980 and early 1990's.

In 1990 there was LPG reforms which stands for liberalization, privatization and globalization which were the key economic reforms introduced in India in the 1990's. These reforms aimed to open up the Indian economy to foreign competition, reduce government control over business and industries and encourage private sector-led growth. The reforms brought significant changes to the Indian economy, including increased foreign investment, higher economic growth and improved infrastructure. However, they also led to increased income inequality, job loss in certain sectors and a rise in the cost of living for many people.

After LPG reforms, economy was open for world which led to many big scams happened between 1990-2008. Some of which were done by Harshad Mehta, Ketan Parekh, etc. These was webseries released named as '1992 Scam' which was based on the story of Harshad Mehta.

In 2008 there was economic crisis which affected world wide economics. Although India was not directly affected but it led to slow down of growth, rising unemployment and decline in consumer confidence. Government responded it by reducing interest rates on loan and increased public spending on infrastructure projects. Despite these efforts took many years for Indian economy to recover from these crisis.

Growth slowed in late 2010's due to structural issues such as weak banking sector and low investment as well as external factors such as a global trade slow down.In recent years, the Indian government has taken steps to spur economic growth, including reducing corporate tax rates and introduction of GST (Goods and Service Tax). After covid-19 impact on Indian economy has recovered in 2023. Also there was introduction of new economic budget for 2023-24.

In conclusion, India's economic development has been impressive over the past few decades with growth. However, there is still lot a room for improvement and addressing structural education, infrastructure and governance will be crucial for India to realize its full potential.

Reference:

1. The Indian Economy (Sanjiv Verma)
2. Indian Economy (Ramesh Singh)

3. Class 11 NCERT
4. Indian Economic Development

Shreeyash Bhosale & Komal Yadav

BE Electrical

DRDO Development in last 65 years

It was formed in in 1958 from the amalgamation of the Technical Development Establishment (TDEs) of the Indian army and the directorate of Technical Development and Production (DTDP) with the Defence Science Organization (DSO).

DRDO is a network of more than 50 laboratories which are deeply engaged in developing defence technologies covering various disciplines, like aeronautics, armaments, electronics, combat vehicles, engineering systems, etc. DRDO is the R&D wing of the military of defence with a vision to empower India with cutting edge defence technologies.

It's pursuit of self-reliance and successful indigenous development and production of strategic system and platforms such as Agni & Prithvi series of missiles, Light Combat Aircraft, Tejas, multi-barrel rocket launcher, Pinaka, air defence system, Akash, a wide range of radars and electronic warfare system, etc. have given quantum jump to India's military might, generating effective defence and providing crucial leverage.

Various programmes of DRDO developed are MARS, IGMDP, etc.

Shantanu Ghanwat

BE Electrical

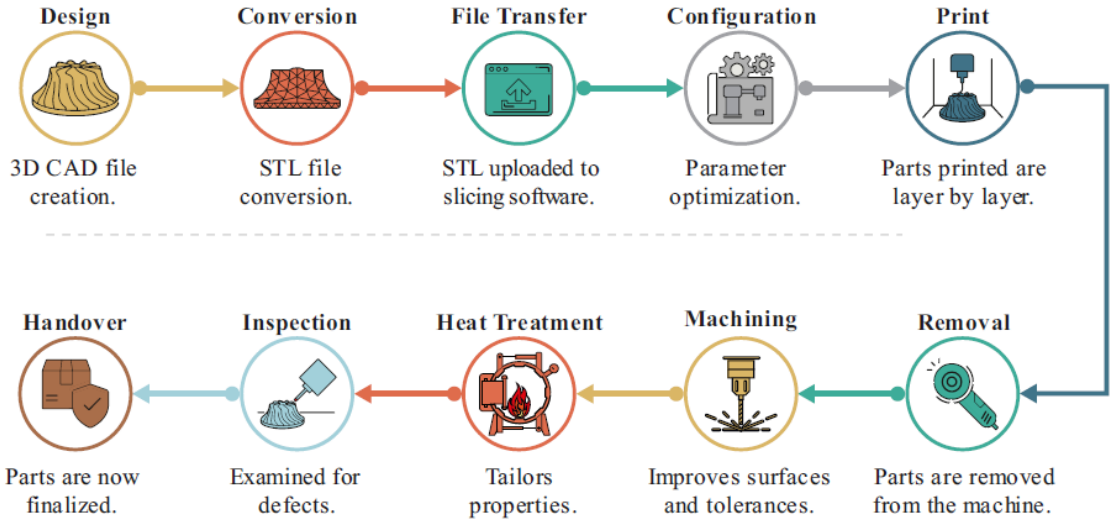
3D Printing -The new era of Manufacturing Field

Additive Manufacturing (AM) and 3D printing have gone from a novelty to a trusted manufacturing method for high-performance products and components.

Additive manufacturing ("3D Printing")were emerged commercially in the mid to late 1980s and heavily leveraged foundational technologies including computer "CNC" control, 2D printing, and laser development."Additive Manufacturing (AM) refers to a process by which digital 3D design data is used to build up a component in layers by depositing material".3D printing, also known as Additive manufacturing, rapid prototyping or freeform fabrication, is 'the process of joining materials to make objects from 3D CAD model data, layer upon layer, as opposed to subtractive manufacturing process' such as machining.Additive manufacturing now enables both a design and industrial revolution, in various industrial sectors such as aerospace, energy, automotive, medical, tooling and consumer goods.Additive manufacturing is complementing other powder metallurgy (PM) technologies.Additive Manufacturing (AM) (or 3D printing), produces objects layer by layer and has the potential to transform next generation manufacturing through expanding design freedom, reducing time to market, bringing production closer to demand and improving industrial sustainability.A transformational, cross-sectoral and, interdisciplinary technology, AM is revolutionizing product design and on-location manufacturing globally, enabling radical product design and re-design, which further accelerate development of new material properties, and transformation of business capabilities through production of more sustainable designs

realised at lower cost.Additive Manufacturing technologies are essentially classified into virtual and physical models The virtual model represents computational models and applications for simulation and optimization. The physical model represents three-dimensional virtual design models that are then speedily fabricated into a physical object. This process is known as rapid prototyping.

The Additive Manufacturing process is detailed below:



Design:The origin of all additive parts is a digital representation of the physical product. This can be achieved with a 3D CAD model incorpo-rating all geometric features as well as additional ones, such as internal infills and support structures.

Conversion: After the design has been completed, the issue of interoperability must be addressed, which refers to the ability of digital technologies to exchange and make use of information with each other. For this reason, a file must be translated into data that can be understood by the metal additive manufacturing machine. This is achieved by converting the 3D CAD file into a standard tessellation language (STL) file.

File transfer: The STL file can then be transferred to the metal additive manufacturing machine or uploaded to a ‘slicer’ software such as Markforged Eiger platform, which converts the 3D data into 2D layers or slices, which can be used to calculate the tool path or G-Code needed to manufacture the object.

Configuration :

Prior to printing, the metal additive manufacturing machine must be properly configured and variables set. Settings of this type would include those related to the process parameters, such as the orientation of the parts, the thickness of the layer, and the inclusion of rafts, among others. The slicing software can also be used to adjust and select these parameters.

Print

The printing phase can vary greatly depending on the technology employed. Depending on the geometry and size, printing is typically the most time-consuming activity taking anywhere from a few hours to several days to complete. However, the printing process is the one activity that requires very little human intervention apart from intermit-tent monitoring of the progress.

Removal :

Once parts are fabricated, they can be removed from the build chamber. Process dependent, parts can also be subjected to a debinding stage to dissolve excess material or sintered in a furnace to achieve part densification.

Machining (optional) :

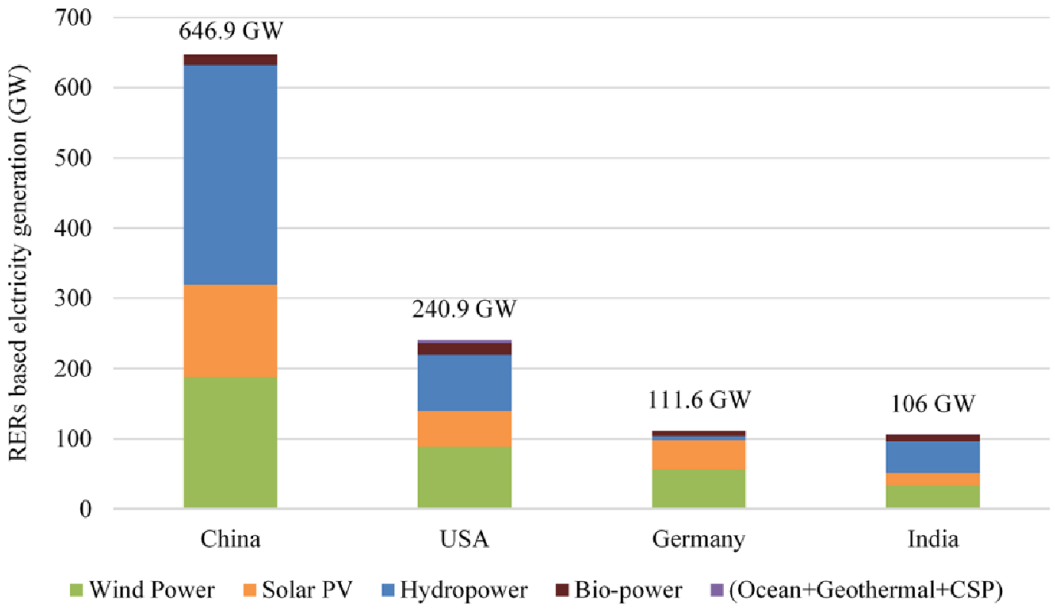
Depending on the intended application, post-processing machining can be carried out to improve tolerances or surface finishes. Build plates and any other auxiliary features, such as support structures, can also be removed either physically or mechanically with either wire EDM or band saws.

Mr. A. J. More

Renewable Energy Resources: An Overview

Traditional fossil fuel–based energy sources have effectively helped in economic growth across the globe in the last century. However, owing to the ever increasing electricity demand, rapid depletion of fossil fuels and their adverse impact on environment, the renewable energy resource based on electricity generation technologies seem to be only alternative and are being pursued extensively across the globe. Renewable energy resource

exist over wide geographical areas as compared with conventional energy sources and are constantly replenished by nature and derived from sun directly (thermal, solar photovoltaic) or indirectly (wind, hydro), besides other natural mechanisms and motions (tidal, geothermal). Renewable energy technologies convert these renewable energy resources (RERs) in to usable form of energy such as electricity, fuels, and heat. It is expected that in the future, the whole world will be powered almost 100% by RERs. According to International Energy Agency (IEA), by 2040, the total RERs based electricity generation will be equal to that of the coal and natural gas–based electricity generation world over. The United States, China, Germany, and India, the four major power consumers in the world and also the major producer of renewable energy resources based power generation (shown in Figure below), have set the ambitious goals for RERs based power generation.



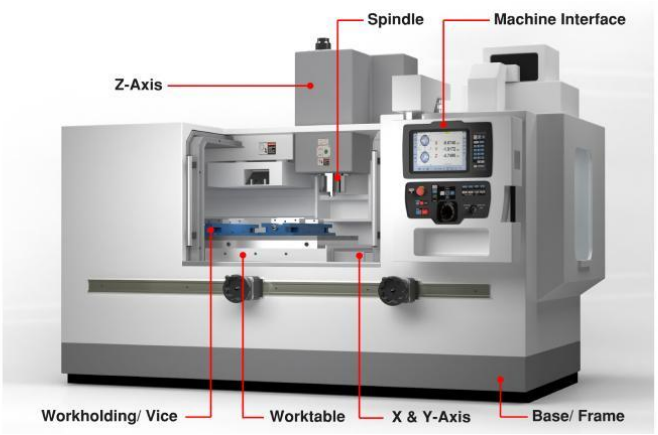
The development of sustainable energy supply systems has been an evolving field in the recent decades. This is because it is required not only to reduce the CO2 emissions to avoid the problems related to global warming but also to identify suitable substitutes for the limited fossil fuels resources. Hence, harvesting, storage, and utilization of renewable energy resources like solar energy are the main focuses of recent investigations in science and engineering. Among the possible directions considered for energy storage, using hydrogen gas (H2) as energy carrier, in particular as fuels for automobiles, is a clean way to store solar energy because only water, hydrogen, and oxygen are involved in the harvest and re-release of energy. One of the main challenges for the building of such a H2-based energy supply system is to develop cheap and safe H2 storage systems. Traditional H2 storage strategies

based on compressing and liquefying H2 are not cheap enough for commercial use, because these processes consume a large amount of energy compared to the chemical energy stored in H2. Hence, scientists have put lots of effort in the identification of new possible materials for H2 storage, which can avoid large energy consumption during H2 charging and discharging processes. However, materials that fulfill the targets set by the U.S. Department of Energy (DOE) are yet to be found. The most recent targets include: usable gravimetric capacity higher than 7.5 wt %, volumetric capacity higher than 70 g/L, system cost less than US$266/kg H2, delivery temperatures between −40 and 85 °C, operating pressures between 3 and 100 bar, and a refueling rate of 5 kg H2 in less than 2.5 min. Various shortcomings are associated with different types of materials that have been proposed in literature. Some of them can only operate at very high or very low temperature. Some others are too heavy; hence, the gravimetric capacities are too low. Still others have very low volumetric capacities or tend to degrade during the H2 charging and discharging processes. These challenges need to be addressed in near future to avoid shortage of energy resources.

Dr. Amol Deshmukh and Dr. Pramod Musrif

Computer Numerical Control (CNC)

CNC stands for computer numerical control. It is a machine controlled by a computer. Its external appearance is similar to that of an NC machine. Tape or Computer Keyboard or Tutor Keyboard is used as input media for CNC machines. For NC machines tape is to be fit repeat to produce repeated jobs.



But for CNC machines tape is fit once and the program is stored in the memory and can be run repeatedly to produce repeated jobs. CNC or computer numerical control is an NC system that employs a dedicated

microcomputer as a machine control unit.

The presence of a microprocessor, RAM memory, ROM memory, input and output devices have increased the level of automation in NC systems. CNC Machine is designed to perform multiple operations in a faster way which increases the flexibility of the machine.

Basic CNC Concept

A CNC system can be described in terms of three major elements:

1. Hardware,
2. Software and
3. Information.

1. Hardware:

Hardware includes microprocessors that affect control system functions and peripheral devices for data communication, machine tool status monitoring, and machine tool interfacing.

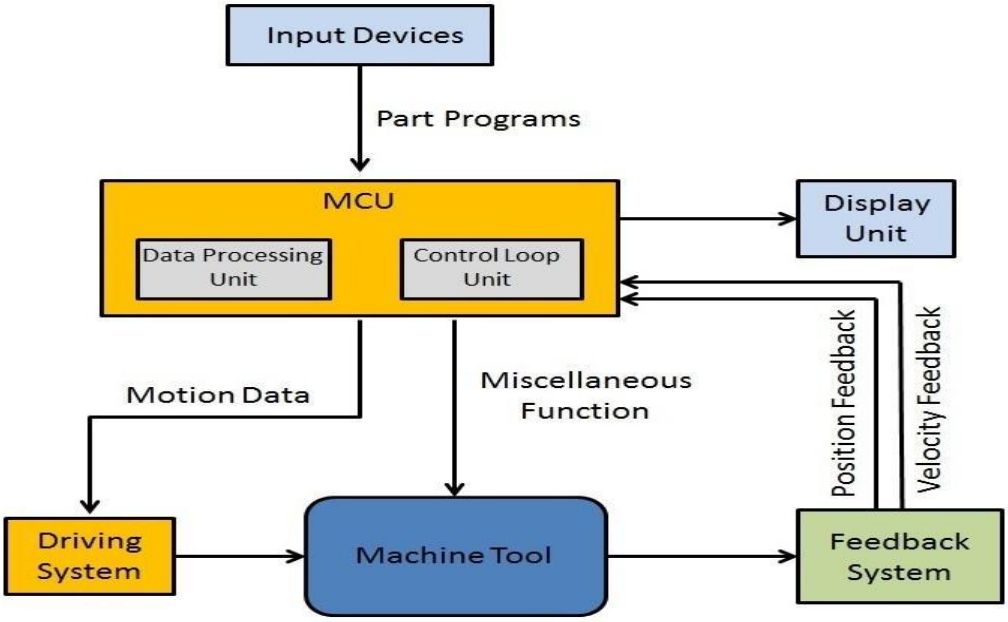
2. Software:

The software includes programs that are performed by system microprocessors and there are different types of software associated with CNC.

3. Information:

Information about the dynamic characteristics of the machine and much other information related to the process. When any of these deceptive components fail, the diagnostics subsystem will automatically separate the faulty component from the system and activate the unnecessary component in place of the damaged one so that the newly installed component can perform its task.

Basic Elements of the CNC Machine:



The main parts of the CNC machine are:

1. Input devices
2. Machine control unit (MCU)
3. Machine tool
4. Driving system
5. Feedback system
6. Display unit

How CNC Machine Works?

First, the part program is entered into the MCU of the CNC.

The MCU processes all the data and according to the program prepared, it prepares all the motion commands and gives them to the driving system.

The drive system acts as motion commands sent by the MCU. The drive system manages the motion and velocity of the machine tool.

The feedback system records the position and velocity measurements of the machine tool and gives a feedback signal to the MCU.

In the MCU, the feedback signals are compared with reference signals and if errors occur, it corrects it and sends new signals to the machine tool to be corrected.

The display unit is used to see all the programs, commands, and other data. It works like the eye of the machine.

Working Principle of CNC Machine:

It consists of two separate controls, a CNC controller that doses the function of program decoding interpolation, diagnostics machine actuation, etc. Another is the programmable logic controller (PLC), which does spindle on-off, coolant on-off, turret operation, etc.

Slides are transferred via their own feed drive (AC or DC) servomotors or ball screws and nut drives. The feed drive controllers the feed drive motors. Suitable transducers have been fitted to either the table or the motor, which measures the slide position.

Also, the position is monitored and checked through the feedback transducers to ensure the accuracy of positioning. The spindle is provided with stepped motors of AC or DC. A suitable control is used to vary is the speed of the spindle motor. A suitable feedback device connected to the shaft monitors the speed. This is how the CNC machine works.

Applications of CNC Machines:

1. Aerospace equipment.
2. Automobile parts.
3. Complex shapes.
4. Electronic industry uses CNC e.g. Printed circuit board.
5. Electrical industry uses CNC e.g. Coil winding.

6. For small to medium batch quantity.

7. Where the set-ups are very large.

8. It used where tool storage is a problem.

9. Where much metal needs to be removed.

10. When the part geometry is so complex.

Mr. Ashish S. Apate

Assistant Professor

Soil Conservation

Introduction

We know that soil and water are two essential natural resources that must be conserved and utilised judiciously. That is because for meeting the food, fiber and shelter needs of the growing population, we need the efficient utilisation of these resources. As you know, there is an increase in population in India and all over the world. That simply means that the various sectors compete for limited soil and water resources, so we should use these effectively, efficiently and sustainably.

Soil

Soil is the loose surface material that covers most land. It consists of inorganic particles and organic matter. Soil provides the structural support to plants used in agriculture and is also their source of water and nutrients. It is defined as the upper part of the earth's crust that is penetrated by plant roots. If you see plants growing under natural circumstances, you can automatically say there will be soil there. That is the very simplified definition. The Soil Science Society of America has formally defined soil more systematically. As per them,

(i) The unconsolidated mineral or organic material on the immediate surface of the earth that serves as a natural medium for the growth of land plants.

(ii) The unconsolidated mineral or organic matter on the surface of the earth that has been subjected to and shows effects of genetic and environmental factors of: climate (including water and temperature effects) and macro- and microorganisms, conditioned by relief, acting on parent material over a period of time. A product-soil differs from the material from which it is derived in many physical, chemical, biological, and morphological properties and characteristics.

Suppose you look at the simplified definition and this sophisticated definition. In that case, the last part is "penetrated by plant roots", and here it says, "it serves as a natural medium for the growth of land plants". Thus, that part is common in both. There we only call earth crust; here, it calls the immediate surface of the earth, and it goes a little finer in detail that it will be a consulted mineral or organic material.

Several concerns emerged around these definitions over recent years, including:

1. Exclusively for the planet Earth: This has created discordance with planetary scientists as they use the term “soil” in relation to other celestial bodies (notably Mars in recent years). This also sent an implicit message that soil science (and therefore research funding) would not be relevant outside planet Earth. There was no compelling reason to limit soil to planet Earth and create unnecessary disagreement within the scientific community.

2. Unconsolidated vs. consolidated soils: Although this distinguishes soil from other surficial material (notably hard rock), it was argued that many soils experience some level of consolidation through internal order in forming aggregates.

3. Multi-phase system: Many regard soil as a medium where solid matter provides a skeleton for soil, but liquids, gases, and biota are also integral components. The old definition only referred to the solid phase of the soil.

4. Soil processes: The second definition focuses on soil-forming factors. In recent years, especially with the heightened interest in soil health, the medium is increasingly described in simpler terms related to physical, chemical, and biological processes, which can also include less conventional soils (e.g., urban and disturbed soils).

It was decided to have a single definition of soil that aims to be inclusive, direct, precise, and succinct. The new definition of soil is

“The layer(s) of generally loose mineral and/or organic material that are affected by physical, chemical, and/or biological processes at or near the planetary surface and usually hold liquids, gases, and biota and support plants.”

Functions of soil

There are several functions of soil, and the most important one is, it serves as a medium for the production of food, fibre, fuel and feed. Then next is it regulates water flow through the terrestrial water cycle. When rainfall occurs, it reaches the soil surface, and once it reaches the soil surface, the first process that begins is infiltration, that is the vertical entry of water into the soil. The infiltration takes place, and that infiltration fills the soil moisture, and once it is completely filled up, excess water percolates and joins the groundwater. Also, when the infiltration capacity is satisfied on the top, then overland flow starts. That is, whatever rainfall comes that starts flowing in the form of overland flow. From the soil moisture, the plant's uptake moisture for their transpiration process, and evapotranspiration occurs. Soil regulates the atmosphere by emitting and absorbing gases like carbon dioxide, methane, water vapour and dust. In today's world, when we are talking about climate change so much, then basically soil exercises sink for storing these greenhouse gases carbon dioxide and methane, which are prevalent greenhouse gases. It also provides a habitat for animals that live in the soil such as mice and organisms viz., bacteria and fungi that account for most of the living things on the earth. Then, soil processes recycled nutrients, including carbon, so that living things can use them over and over again. That is responsible for the basic recycling of the nutrients. Finally, the soils serve as an engineering media for constructing foundations, roadbeds, dams and buildings.

Soil as resource

The World Resources Institute in 1997 has given, that there are 12.66 billion hectares of land on the earth's surface. Out of which 3.96 billion hectares or 31.2 percent is too dry to support any cultivation, which means this is not available for cultivation. Another 2 billion hectares or 15.8 percent of the total earth surface soil that occurs in the cold tundra region means these conditions are too cold for any crop to grow. That leaves us with 5.92 billion hectares or 46.8 per cent of the total 12.66 billion hectares of land that could be cultivated. Out of these, around 4.92 billion hectares or 38.8 percent of the total land, is currently being cultivated.

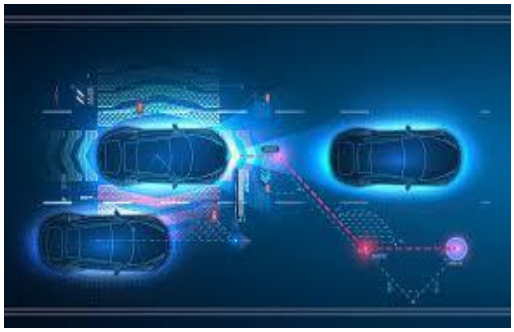
The world soil condition shows that the soils are getting degraded in many regions. and that is why soil management is crucial. Everything may seem gloomy but; if you look at the nutrient availability of soils in India, you find that there are no or slight constraints, which means that the soil in India is of good quality and they are very productive. If you can manage them well, we will get a very high level of production.

Advanced Driver Assistance Systems (ADAS)

What is ADAS??

Advanced Driver Assistance Systems (ADAS) is currently a crucial component and a selling point for cars. ADAS is a practical safety feature which enhance the safety of occupants. In India, consumers now want their cars to include this capability, which has become a new popular featured (Advanced Driver Assistance Systems) are passive and active safety systems designed to remove the human error component when operating vehicles of many types. ADAS systems use advanced technologies to assist the driver during driving, and thereby improve drivers' performance.

History



The evolution of ADAS emerged and started with a gentleman called Ralph Teetor. He invented the modern cruise control, originally known as Speedostat. This was adapted and made up of a dashboard speed selector that connected to an engine compartment mechanism. The MG Gloster was the first mass-market car in India to get ADAS.

Composition of ADAS : sensors and software

ADAS sensors are a group of automotive sensors used in advanced driver assistance systems. These sensors help keep drivers safe by providing information about the car's surroundings.The QNX® Platform for ADAS provides a software foundation that enables these and other automated driving applications. And it is built upon the QNX® OS for Safety, certified by TÜV Rheinland to ISO 26262 ASIL D.

Classification of ADAS:

There are many different types of ADAS technologies—which can make it difficult to understand

how they all fit under the larger umbrella of “ADAS.” However, ADAS technologies can generally be categorized into four different types of ADAS systems: adaptive, automated, monitoring, and warning. Vehicles with some driver-assist systems are a Level 1; vehicles with limited hands-free systems like Ford’s BlueCruise and GM’s Super Cruise and, yes, Tesla’s Full Self-Driving are a Level 2.ADAS Level 3 – Conditional Automation: Nonetheless, when the system asks it, the driver is supposed to take control. Example: The driver can sit back and relax as the system handles everything — acceleration, steering, and braking — thanks to features like traffic jam pilot.

Drawback of ADAS:

ADAS alerts and notifications can be spoofed by applying adversarial machine learning techniques to traffic signs, allowing attackers to control the output of the ADAS for their benefit.

Flaws and high cost among the negatives ADAS features may not work correctly all the time. The sensors may mistake a car in the next lane for an oncoming vehicle and apply the automatic emergency braking when drivers are on an on-ramp. Cost is another obstacle, especially when auto insurers are not providing discounts.

Advantages and benefits of ADAS:

Jijnyasa Joshi

BE Instrumentation

EMBEDDED SYSTEMS and SECURITY

The technological world of today runs on a hidden technology called as Embedded Systems. Embedded system security is an approach strategically to protect the software that is running on top of the embedded systems from any severe threats. Security in embedded systems is a topic that has received an increasing amount of attention from industry and academia in recent years. Embedded system security is an approach strategically to protect the software that is running on top of the embedded systems from any severe threats. Programmable hardware with the integration of the operating system and software combines to form an embedded system. They are built to work as a committed function or a group of functions.

Now a day we are going towards the age of fully autonomous environment where things will be done within a second and without as much influence of human. This has made possible by increasing use of embedded systems in all domains. These devices are inherently vulnerable to many operational problems and intentional attacks due to their embedded nature. Network connectivity opens even more avenues for remote exploits.

Embedded systems are being deployed in a wide range of application areas ranging from control of safety-critical systems to data collection in hostile environments. From cars to cell phones, video equipment to mp3 players and dishwasher to home thermostats, embedded computers increasingly permeate our systems are being deployed in a wide range of application areas ranging from control of safety-critical systems to data collection in hostile environments. From cars to cell phones, video equipment to mp3 players and dishwasher to home thermostats, embedded computers increasingly permeate our lives

What is embedded system Security?

An embedded system is a computer system of a combination of a computer processor, computer memory, and input/output peripheral devices that has a dedicated function within a larger mechanical or electronic system.

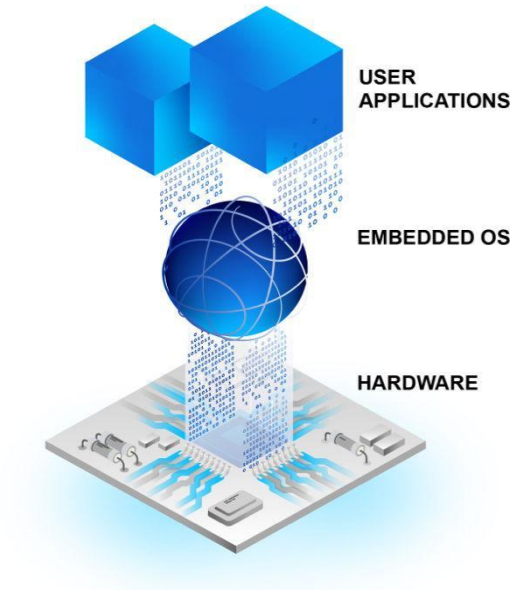
Embedded systems security is a cybersecurity field focused on preventing malicious access to and use of embedded systems. It provides mechanism to protect a system from all malicious behavior.

There are two types of security apply to embedded systems: physical security and software security.

I. Physical security : locked door, surveillance cameras, it limits access to sensitive areas and equipment. Immutable memory technology, such as eFuses to store secure bootloader keys, tamper-resistant memory, protected key stores and security enclaves to protect sensitive code and data.

II. Software security manages and responds to malicious behavior happening in the system, Software security features include authentication of a device to a network, firewalling network traffic and stringent hardening of system software to name a few.

We have also witnessed many embedded systems attacks. Over the decade's we are not taking it seriously. Few of them we are discussing here. Before a decade, TJX credit card breach compromised 94 million credit and debit card numbers. An unknown number of intruders stole all this data from one of its systems over a period of more than 18 months. Later, it was discovered that the reason for this breach was an insecure wireless network connection. Rebug, a custom firmware for Sony PlayStation had access to the developer-only network and allowed "illegal" operations. Multifunction printers that had access to sensitive company data on many corporate networks.



Few of the attacks and their countermeasures we can see in the following table:

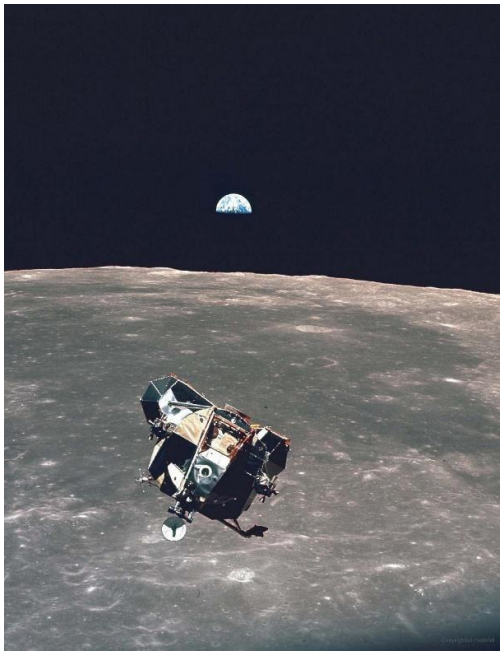
Category	Attack	Countermeasures
Software-based attack	Malware	Anti-malware application [21], Machine-learning-based application [22]
	Brute force	Limiting the number of tries
	Buffer overflow	Hardware/Software Defender technique [23]
	Web-based vulnerability	Sandboxing [24]
Network-based attack	MITM	IPsec [25]
	DNS poisoning	DNSSEC [26]
	Session hijacking	Encryption, disposable credits [27]
	Signal jamming	Anti-jamming mechanism [28]
Physical and side-channel based attacks	Power Analysis	Data Masking technique [29]
	Timing Attacks	Random clock technique [5]
	Electromagnetic Analysis Attack	Shielding techniques [30], Asynchronism [30]

Sumeet Saibi

BE Instrumentation

SPACE TECHNOLOGY

In the early twenty-first century, the plan to launch a wide variety of spacecraft for astronomy, remote sensing, communications, crewed and robotic exploration, and other activities are in the consideration around the world. Advanced space technologies are required for potential future space activities at lower cost and improved performance than current ones. To enable ambitious future space activities and to achieve its long term goals, it needs efforts in space research and technology development in critical areas needed for the long terms. Key Technologies for Development The high risk, high payoff technologies which have the greatest potential for improving the capabilities and reducing the costs of the space organisation, other government and commercial space programs in the2000 to 2050 time period are to be determined. It also involves the determination of which of these technologies could benefit most from long lead time development. Determining the exact amount of funding is beyond the scope of this report, but NASA has assumed that funding each technology of about 3 million to 5 million a year for three to five years would be sufficient to create a high probability of significant advances. The list of key technologies is not static, nor does It represent all of the high risk; high payoff technologies NASA should pursue. The technologies below represent a small but broad investment portfolio that appears to build high promise for large future benefits at the cost of a small investment.



Wideband communications over Planetary Distances Wideband, high data- rate communications over planetary distances could enable live transmissions of highresolution images from robotic rovers, orbiters, and astronauts on mission to other planets. The need to develop technologies including high-precision

spatial acquisition and tracking systems and high-efficiency lasers to support such communications over planetary distances. Precisely Controlled Space Structures Structures in weightless environment especially structures that are unique to space pose difficult control challenges. These challenges must be met to enable the next generation of instruments for space based astronomy and to support the development very large antennas for communications and remote sensing. As far as research in this area is concerned NASA in uniquely suited for this type of research in area such as controlling deformable reflectors and formation flying of spacecraft to created distributed sensors. Microelectromechanical systems for Space Microelectromechanical systems could enable the development of small, relatively low cost spacecraft devices and subsystems with very low mass, volume and power consumption. These systems could be used to enhances conventional; spacecraft or to create miniature spacecraft that could be enable a broad range of new space activities. Although a vitreous government and industry supported Microelectromechanical systems research effort is underway, little to this work is aimed at space applications. Space Nuclear Power Systems Advanced space nuclear power systems will probably be required to support deep space missions, lunar and planetary bases, extended human exploration missions, and high thrust, high efficiency propulsion systems.

A major investment will eventually be needed to develop advanced space nuclear power sources, but low-cost research and technology development investments can make the systems that are eventually developed more efficient, less expensive and safer. Low-Cost, Radiation-Resistant Memories and Electronics Radiation in the space environment can damage sensitive electronic, disrupt signals, cause single-event phenomena, and degrade microelectronic device. Low cost, high capacity, low mass, radiation-resistant memories and electronics are not currently available. But NASA's support lays the groundwork for major improvements in radiation-resistant memories and electronics. Extraction and Utilization of Extraterrestrial Resources The capacity to extract and utilize space resources can significantly improve the performance and lower the cost of planetary exploration, reduce the cost of constructing and shielding human habitants, and enable and accelerate the development of new generations of in space capabilities. Interplanetary Propulsion Technologies Solar Electric Propulsion

Propellants. These technologies reduce the cost of planetary exploration, and would enable the development of new generation space technology.

Siddhi Sherkar

BE Instrumentation

Robotic Process Automation

Robotic Process Automation (RPA) is being incorporated in several business processes, thanks to its ability to emulate human and digital interactions. It is best suited for processes with repeatable, predictable interactions with IT applications.

The robots take over routine processes by mimicking the way humans interact with applications through a user interface and follow simple rules to arrive at decisions.

Unlike a human, RPA bot can work more efficiently and quickly than most humans can. This brilliant combination of human-like interactions and software-like accuracy make robotic process automation an ideal technology at a time when the business landscape has become increasingly competitive.

Today businesses realize that technology is the backbone of their growth. CIOs are looking to emerging technologies to improve operations and reduce costs. RPA is filling this need by serving as an invaluable resource for streamlining operations. With RPA, employees can save up on the time spent on mundane tasks and indulge in meaningful work.

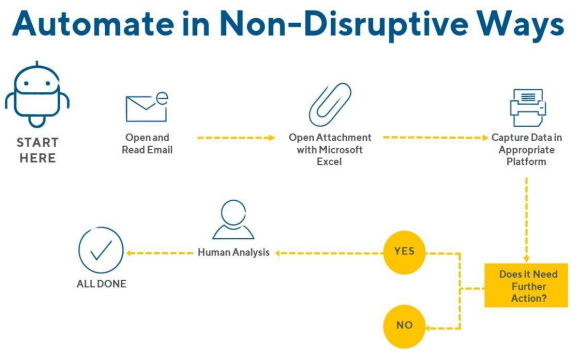
Applications and use cases of RPA in various industries:

The application of RPA process has proven to yield positive results on the business productivity. Its adoption has grown tremendously – at a rate than ever before. For sectors like insurance, banking, and financial services, RPA remains as the most preferred business service with more enterprises now appreciating and investing in the technology. In fact, the range of sectors now

adopting RPA is also growing and expanding to include utilities, manufacturing, hospitality, and mining, among others.

Factors that accelerate business ROI with Robotic process automation:

Undeniably, the adoption of RPA is on the rise due to its capability to deliver rapid ROI and the fact that it allows for increased control over operations. However, for a holistic and clearer understanding, it does no good to measure the ROI of RPA adoption with just financial gains. To understand the whole capability of the RPA automation, one needs to widen their approach more so since there are several business benefits to it.



With RPA speeding up processing times and reducing costly errors, processing costs decline and per-employee output increases. Common savings from these efficiency improvements fall within between 25% and 50%.

Vaishnavi Phadtare

BE Instrumentation

ARTIFICIAL INTELLIGENCE

Despite its widespread lack of familiarity, AI is a technology that is transforming every walk of life. It is a wide-ranging tool that enables people to rethink how we integrate information, analyse data, and use the resulting insights to improve decision making. Our hope through this comprehensive overview is to explain AI to an audience of policymakers, opinion leaders, and interested observers, and demonstrate how AI already is altering the world and raising important questions for society, the economy, and governance.

In this article, we discuss novel applications in finance, national security, health care, criminal justice, transportation, and smart cities, and address issues such as data access problems, algorithmic bias, AI ethics and transparency, and legal liability for AI decisions. We contrast the regulatory approaches of the U.S. and European Union, and close by making a number of recommendations for getting the most out of AI while still protecting important human values. In order to maximize AI benefits, we recommend nine steps for going forward:

- Encourage greater data access for researchers without compromising users' personal privacy,
- Invest more government funding in unclassified AI research,
- Promote new models of digital education and AI workforce development so employees have the skills needed in the 21st-century economy,
- Create a federal AI advisory committee to make policy recommendations,
- Engage with state and local officials so they enact effective policies,
- Regulate broad AI principles rather than specific algorithms,
- Take bias complaints seriously so AI does not replicate historic injustice, unfairness, or discrimination in data or algorithms,
- Maintain mechanisms for human oversight and control, and
- Penalize malicious AI behaviour and promote cybersecurity.

I. QUALITIES OF ARTIFICIAL INTELLIGENCE

Although there is no uniformly agreed upon definition, AI generally is thought to refer to "machines that respond to stimulation consistent with traditional responses from humans, given the human capacity for contemplation, judgment and intention." According to researchers, these software systems "make decisions which normally require [a] human level of expertise" and help people anticipate problems or deal with issues as they come up. As such, they operate in an intentional, intelligent, and adaptive manner.

Intentionality

Artificial intelligence algorithms are designed to make decisions, often using real-time data. They are unlike passive machines that are capable only of mechanical or predetermined responses. Using sensors, digital data, or remote inputs, they combine information from a variety of different sources, analyze the material instantly, and act on the insights derived from those data. With massive improvements in storage systems, processing speeds, and analytic techniques, they are capable of tremendous sophistication in analysis and decision making.

Artificial intelligence is already altering the world and raising important questions for society, the economy, and governance.

Intelligence

AI generally is undertaken in conjunction with machine learning and data analytics.[5] Machine learning takes data and looks for underlying trends. If it spots something that is relevant for a practical problem, software designers can take that knowledge and use it to analyze specific issues. All that is required are data that are sufficiently robust that algorithms can discern useful patterns. Data can come in the form of digital information, satellite imagery, visual information, text, or unstructured data.

Adaptability

AI systems have the ability to learn and adapt as they make decisions. In the transportation area, for example, semi-autonomous vehicles have tools that let drivers and vehicles know about upcoming congestion, potholes, highway construction, or other possible traffic impediments. Vehicles can take advantage of the experience of other vehicles on the road, without human involvement, and the entire corpus of their achieved "experience" is

immediately and fully transferable to other similarly configured vehicles. Their advanced algorithms, sensors, and cameras incorporate experience in current operations, and use dashboards and visual displays to present information in real time so human drivers are able to make sense of ongoing traffic and vehicular conditions. And in the case of fully autonomous vehicles, advanced systems can completely control the car or truck, and make all the navigational decisions.

II. APPLICATIONS IN DIVERSE SECTORS

AI is not a futuristic vision, but rather something that is here today and being integrated with and deployed into a variety of sectors. This includes fields such as finance, national security, health care, criminal justice, transportation, and smart cities. There are numerous examples where AI already is making an impact on the world and augmenting human capabilities in significant ways.

Aakanksha Patil

BE Instrumentation

LiDAR Technology

You may have already seen some news and information about new products bringing one or more integrated Lidar sensors. The latest versions of premium iPhones feature LiDAR technology. Lidar is the acronym for the words ‘Light Detection And Ranging‘. It uses remote sensing to measure the properties of reflected light. The technology as a whole can measure the correct distance between different objects.

This technology is usually present in specific devices (such as photographic cameras). Despite this, companies are also starting to explore the possibility of adding the sensor to some other gadgets. It is present from simple devices, such as electronic rulers for architects to other more complex devices. Its operation will be detailed below. Its uses are quite varied and can be explored further.

The Lidar sensor is a pulsed laser system. It is widely used for obtaining spatial information. As mentioned, it can measure and get the actual distance objects are from each other, but it can also be used to define measurements. It can also be found by another name, LADAR (Laser Detection and Ranging). The applications, uses and technologies are the same, it's just another way of being called.

Lidar can measure distances through light. It is done normally, since the light source comes from laser beams in the near-infrared (IR) band, emitted by the sensor itself. It can model the terrain surface three-dimensionally. The more beams present in the sensor, the greater its range. When it is used in environments with living beings – animals or people – the amount of light source is lower. A big benefit is that it is low energy. This is because the beam is not very strong. If a very strong beam hits the vision, it can damage if it is too intense. The larger the sensor, the more beams it will be able to emit. This is valid for satellites with Lidar, which orbit around the Earth. They can reach thousands of kilometers away with the same precision.

This system can be present on both mobile and fixed platforms. This indicates that Lidar can be implemented in a tower, fixed to the ground, in an airplane, or even inserted into gadgets, along with several other sensors. LiDAR combines the Global Navigation Satellite System (GNSS) and the Inertial Navigation System (INS). The GNSS is responsible for providing the location of the aircraft in space, thus being able to inform where the objects are. The INS informs the altitude angles of what is being measured.

One of the use will be in autonomous vehicles, aircraft, and machines. Although we think only of cars, agricultural machines already make use of these technologies. The technology is used in engineering projects primarily to obtain accurate topographic surveys. It is especially important for the elaboration of digital models intended for exact studies of the environment.

Mrs. C. D. Rananaware

Assistant Professor

IBM and NASA to research impact of climate change with AI

New IBM foundation model technology leverages NASA earth science data for geospatial

Intelligence:

IBM and NASA's Marshall Space Flight Center have announced a collaboration to use IBM's AI technology to discover new insights in NASA's massive trove of Earth and geospatial science data. The joint work will apply AI foundation model technology to NASA's Earth-observing satellite data for the first time.

Foundation models are types of AI models that are trained on a broad set of unlabeled data, can be used for different tasks, and can apply information about one situation to another. These models have rapidly advanced the field of natural language processing (NLP) technology over the last five years, and IBM is pioneering applications of foundation models beyond language.

Earth observations that allow scientists to study and monitor our planet are being gathered at unprecedented rates and volume. New and innovative approaches are required to extract knowledge from these vast data resources. The goal of this work is to provide an easier way for researchers to analyze and draw insights from these large datasets. IBM's foundation model technology has the potential to speed up the discovery and analysis of these data in order to quickly advance the scientific understanding of Earth and response to climate-related issues.

Technologies to extract insights from observations of Earth:

IBM and NASA plan to develop several new technologies to extract insights from Earth observations. One project will train an IBM geospatial intelligence foundation model on NASA's Harmonized Landsat Sentinel-2 (HLS) dataset, a record of land cover and land use changes captured by Earth-orbiting satellites. By analyzing petabytes of satellite data to identify changes in the geographic footprint of phenomena such as natural disasters, cyclical crop yields, and wildlife habitats, this foundation model technology will help researchers provide critical analysis of our planet's environmental systems.

Another output from this collaboration is expected to be an easily searchable corpus of Earth science literature. IBM has developed an NLP model trained on nearly 300,000 Earth science

journal articles to organize the literature and make it easier to discover new knowledge. Containing one of the largest AI workloads trained on Red Hat's OpenShift software to date, the fully trained model uses PrimeQA, IBM's open-source multilingual question-answering system. Beyond providing a resource to researchers, the new language model for Earth science could be infused into NASA's scientific data management and stewardship processes.

Pratiksha Rode

TE-IT

Is Quantum Computing for Real?

Well, maybe and maybe not.

Quantum computing is an area of computer science that leverages the laws of quantum mechanics to help organizations solve complex problems that can't be solved by traditional high-performance computers. Quantum mechanics is the theory of the physical properties and interactions everything at the atomic and subatomic level.

The goal is to apply quantum theories to enhance computing at a core level, allowing computers to process, compare, order and contrast massive amount of data at insane speeds. With proper application, a quantum computer could compare several potential outcomes to a complex set of data and identify the best one within a fraction of a second.

However, as it's still early days, use cases are effectively hypothetical and experimental. But forecasts indicate that quantum computing is set to transform numerous Industries, and create as much as $850 billion in annual value by 2040.

Still, advancements in quantum computing serve as "powerful reminders that the technology is rapidly advancing toward commercial viability," according to McKinsey & Co.

Advantages and Disadvantages of Quantum Computing

The main advantage of quantum computing is that it involves computers that can perform calculations 158 million times faster than today's fastest supercomputers. Quantum computers are so powerful, they can accomplish in four minutes what it would take traditional supercomputers 10,000 years to complete.

In addition, quantum computers are able to solve more complex problems than typical computers -- and even supercomputers -- and they can run highly complex simulations. An Australian company has built software that it says will boost the performance of quantum-computing by up to 2,500%.

But one of the downsides of quantum computers is that they are extremely error-prone. Consequently, companies are investing a lot of talent and money into trying to come up with ways to build computers that can identify their own mistakes and correct them. Although there have been some major advances in this area, quantum errors will likely always be around.

In the past year, a Japanese research center said it had realized a breakthrough in quantum computing "that could improve error correction in quantum systems and potentially make large-scale quantum computers possible," McKinsey noted.

Yet, "even with highly accurate quantum computers, verifying the end results with classical computers will remain necessary." There is a core difference between quantum computing and classical computing. where classical computing uses zeros and ones to represent data sets, quantum computers use qubits. Unlike ones and zeros that function on a single property on/off basis, qubits are multifunctional and can be both on and off at the same time to represent new forms of data.

Nevertheless, as the pace of breakthroughs accelerate, more organizations are investing in quantum computing and more and more startups are focusing on the technology. Additionally, major tech firms, including Amazon, Google, IBM, Microsoft and Alibaba have already rolled out commercial quantum-computing cloud services, according to McKinsey. Industries that Could Realize the Earliest Use Cases According to McKinsey, these four industries could realize short-term benefits from quantum computing: pharmaceuticals, chemicals, automotive and finance. However, McKinsey added that, "some experts indicate that not enough time and resources have been invested in developing use cases to reliably indicate which use cases are more or less viable."

Quantum computing will likely be used with conventional high-performance computing until around 2030. "For example, conventional high-performance computers may benefit from quantum-inspired algorithms," stated McKinsey. After then, it will be up to private companies and public institutions to continue their work to improve quantum hardware and enable more use cases as well as more complex use cases. "Six key factors -- funding,

accessibility, standardization, industry consortia, talent and digital infrastructure -- will determine the technology's path to commercialization," said McKinsey.

SAMRUDDHI DEORE

BE–IT

How VR and AR are empowering healthcare industry

With the advent of AR and VR technologies, the gates to new opportunities are now wide open in the healthcare industry.

The acceptance of immersive technologies is on the rise and the healthcare industry hasn't been an exception. According to a report from Report buyer, Augmented Reality (AR) and Virtual Reality (VR) in healthcare industry will touch US$5 billion growing at a pace of 36.6 per cent compound annual average.

With the advent of AR and VR technologies like Magic Leap and Microsoft HoloLens, the gates to new opportunities are now wide open in the healthcare industry. These immersive visual technologies combine virtual and real environments and are usually referred to as Extended Reality or XR technology.

VR is when the user is immersed in an absolutely virtual environment, while augmented reality abbreviated as AR is when virtual environment or objects are overlaid on real environment to enhance contextual meaning.

Here are some of the ways XR technologies are going to shape the healthcare industry in the near future.

- Facilitating medical learning and healthcare training:

One of the key benefits of XR technologies lies in improving the quality of learning and training for medical professionals while driving costs down and enhancing retention and understanding.

- Realistic 3D visualisation:

AR and VR technologies can help medical professionals to learn physiology and anatomy of the human body in an effective manner. Conventional training procedures involve static two-dimensional images where a medical student has to rely on his or her own mental

imagination to complete the picture. XR technologies enable students to see every detail in full immersion improving the learning process.

- Enhanced patient care and education:

Not only medical professionals but patients can also derive a number of practical benefits from AR and VR technologies helping them understand the medical conditions and details about treatment and a variety of procedures.

- Virtual assistance in medical facilities:

Augmented reality-based navigation can make it quick and convenient for patients to find exactly what they are looking for. It can also help nurses and other medical professionals to find the right spot as well as equipment during emergencies and critical situations.

Virtual assistance through AR can also enhance the orientation experience in hospitals and medical clinics to ensure the audience grasps the concepts being explained to them clearly and have a much higher chance of retaining the information.

Shravani Shewale

TE IT