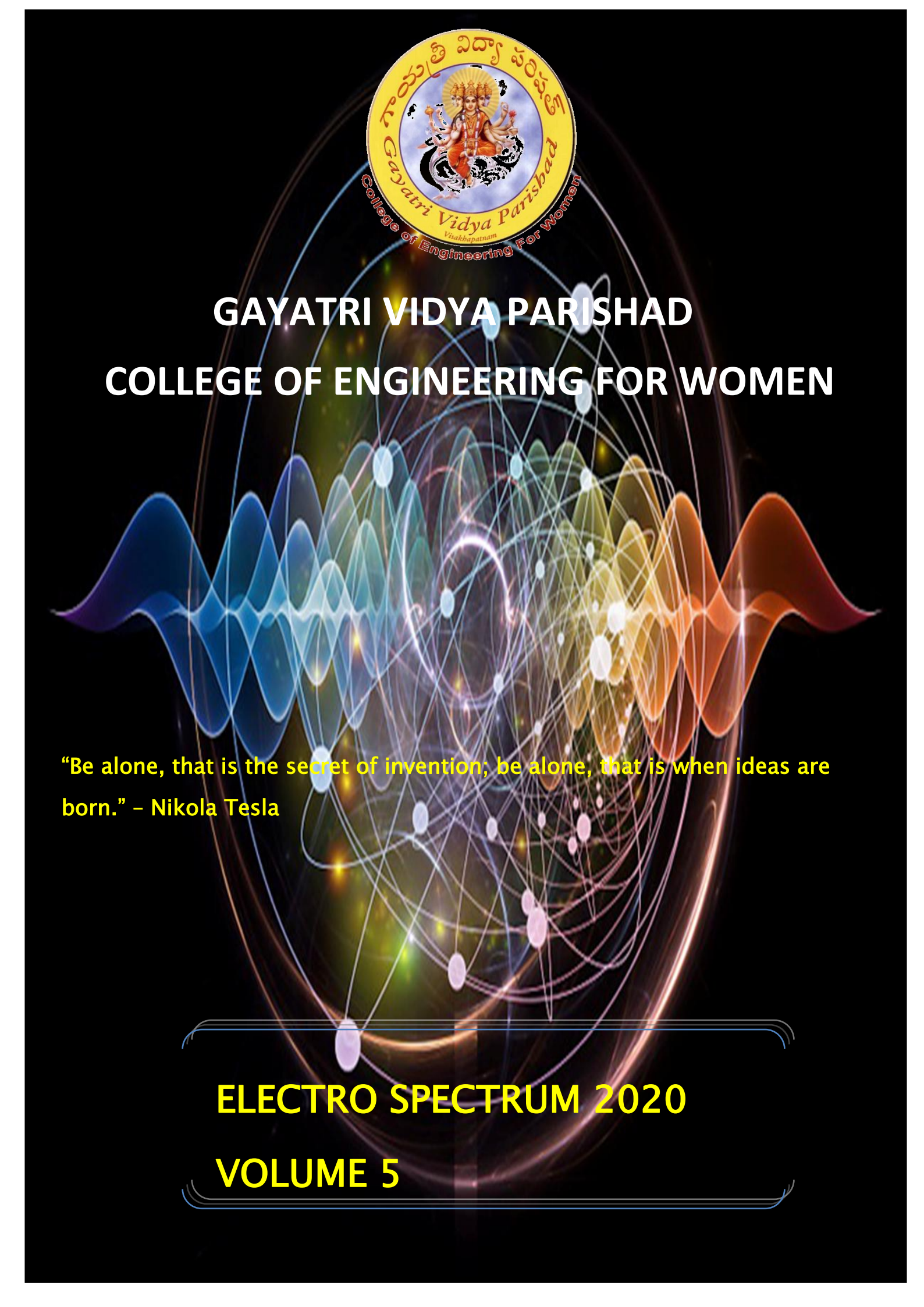
GAYATRI VIDYA PARISHAD
COLLEGE OF ENGINEERING FOR WOMEN



"Be alone, that is the secret of invention; be alone, that is when ideas are born." – Nikola Tesla

ELECTRO SPECTRUM 2020

VOLUME 5

Department Vision:

Produce competitive engineers instilled with ethical and social responsibilities to deal with the technological challenges in the field of Electronics and Communication Engineering.

Department Mission:

- Facilitate a value-based educational environment that provides updated technical knowledge.
- Provide opportunities for developing creative, innovative and leadership skills.
- Imbue technological and managerial capabilities for a successful career and lifelong learning.

Program Educational Objectives

After successful completion of the program, the graduates will be able to:

- PEO-1: Analyze and apply the knowledge of Mathematics, Science, and Engineering concepts for solving Electronics and Communication Engineering problems.
- PEO-2: Solve complex problems in Electronics and Communication Engineering and its allied areas to attain optimum solutions.
- PEO-3: Excel in chosen career by exhibiting life skills and professional ethics in multidisciplinary fields through continuous learning and research.

Program Specific Outcomes

Engineering Graduates will be able to:

- PSO-1: Acquire knowledge required for designing Electronics and Communication systems.
- PSO-2: Design, simulate and implement essential modules in the areas of Electronic circuits, VLSI, Embedded systems, Communication and Signal processing.

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Editorial Message:

Dear readers,

We are delighted to bring the ELECTRO SPECTRUM – 2020, Volume 5. We have made sure that you enjoy reading the magazine and relish the experience.

This magazine would not have been possible without the help of you, the readers, every member of the ELECTRO SPECTRUM family and faculty members who brought us so.

Finally, we urge our readers to send in their valuable suggestions to help us improve their reading experience and also make sure send in your articles which we will be more than happy to publish.

Message from Prof. K. Raja Rajeswari

Dept. of ECE, Director (R&D), GVPCEW

It gives me immense pleasure that the *Department of Electronics and Communication Engineering* is bringing out 5th issue of Electro Spectrum 2020 Magazine which has been initiated during 2016. Since then the department is putting hard efforts to bring out this Magazine as a standard master piece.

This focuses mainly on the articles useful in the present day Technical Era. This magazine builds broader outlook in the students as well in the faculty of ECE fraternity. The technical and general articles are invited both from faculty and students to contribute.

Rapid advancement is taking place in communications field mainly in the 5G technologies. Although ICT is often considered as extended synonym for information technology, its scope is broader. Information and communications technology (ICT) refers to all the technologies used to handle telecommunications, broadcast media, artificial intelligence, robotics etc.

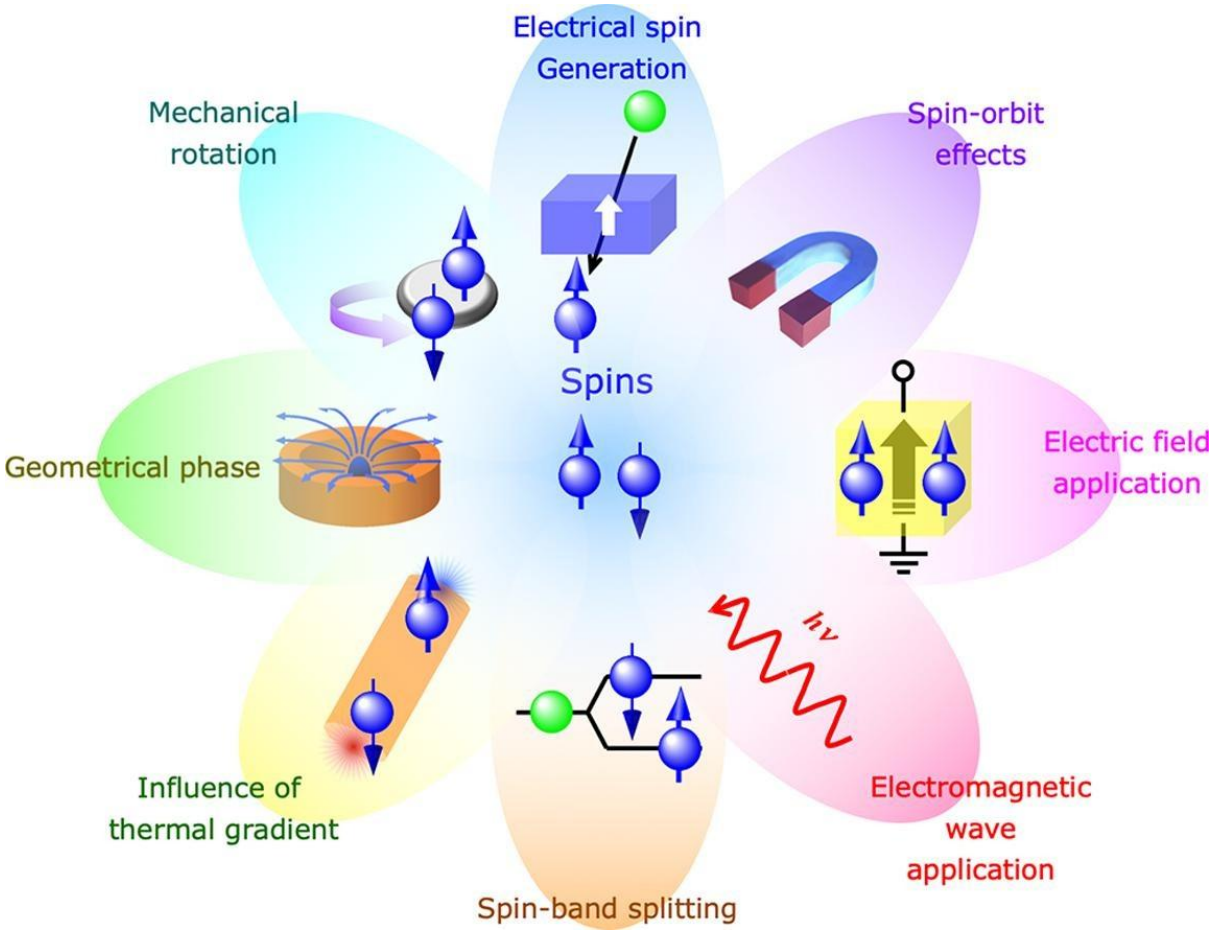
The magazine covers the articles of technical importance. The magazines of this sort are useful to update the knowledge in the domain area.

On the other side not only purely technical articles but also the articles related to career opportunities to the students after completion of the course like how the branch ECE opens up great career prospects for the students is need of the day. Some of the articles should also have to provide information how the students after completion of the UG program can easily avail job opportunities in manufacturing industries and service organizations such as broadcasting, data communication, entertainment and system support etc. The candidates can also work in modern multimedia service firms that are involved in real-time transfer of information through video conferencing and internet broadcasting. Such sort of articles is to be encouraged for better outlook of the students in the field of specialization.

I wish the department all success in bringing out the current issue and to bring many more future editions.

Cover story – Spintronics:

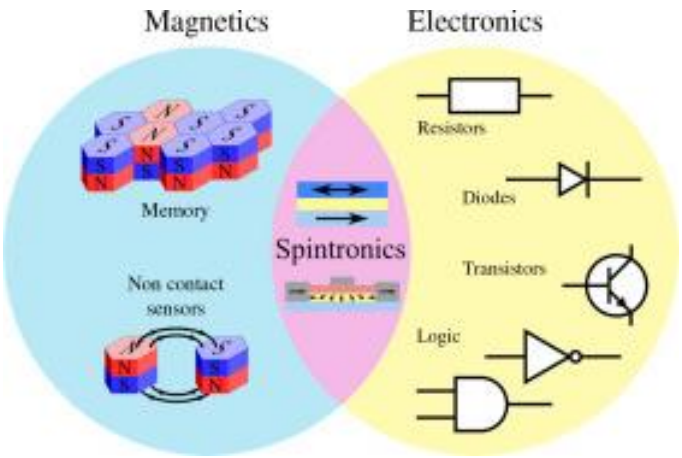
Electronics is changing in size, speed of information processing and size of components. We are now thinking in terms of molecular electronics and quantum computers. The latest of the leading disciplines in these fields is called spintronics or spin electronics.



It is based on a fundamental property of the electrons: their spin, that is to say, their ultra-rapid rotation on an axis, like a miniature Earth rotating on itself. In addition to their electric charge and mass, the electrons are also characterized by their spin. This rotation creates a magnetic field (like the one on Earth, to indicate the North with a compass). The angular momentum of the spin, represented by a vector (a small arrow), can have two directions: if the rotation is "from west to east" it is said that the spin is "up" (north) or in the opposite direction that he is "down" (south). In a magnetic field the electrons "up" or "down" have a different energy.

By manipulating this spin with appropriate components, it is possible to control the flow of electrons and thus memorize information and perform data processing under conditions of size and speed never before achieved. In fact, the techniques of conventional computers

use electron flows controlled by electric fields and whose intensity, detected by magnetic sensors, makes it possible to record or read "bits" of information expressed as 0 or 1.



In a normal current, the spins of the electrons are randomly oriented. This spin plays no role in determining the resistance of a circuit or the amplification of a transistor. With spintronics, each electron can depend on the direction of its spin, represent an information bit, called quantum bit or qubit. Thus, not only the charge but also the spin of the electron is exploited, which opens up extraordinary possibilities for computer science. For example, the new components that are being researched in many international laboratories are capable of modifying the transport of electric current according to the orientation of the electron spin.

Spintronics was born in 1988 when French and German physicists discovered an effect called giant magneto resistance (GMR), exploiting the effects of electron spin in multilayers of magnetic materials. Many problems remain before the industrialization of spintronics components: the transport distance of excitations, the life of components, or the need for operation at very low temperatures to prevent loss of spin alignment.

A team from the University of Buffalo has achieved a breakthrough in this field by obtaining a manganese and gallium antimonide sandwich semiconductor operating at room temperature while maintaining spin alignment properties. The perspectives opened up by this work give hope for the near-development of a spintronics semiconductor allowing combining logical processing, memory, and communication on a single "molecular" chip measuring barely a hundred nanometers. At this scale, the most powerful computer known today would be the size of a piece of sugar.

Advantages of Spintronics:

Spintronics has a few favourable circumstances over regular hardware. Electronics require particular semiconductor materials so as to control the progression of charge through the transistors. But spin can be measured very simply in common metals such as copper or aluminium. Less energy is expected to change turn than to create a current to keep up electron charges in a device, so spintronics gadgets utilize less power.

Spin states can be set rapidly, which makes transferring information snappier. And because electron spin is not energy-dependent, spin is non-volatile – data sent utilizing spin stays fixed even after the loss of power.

Upgrading hard disks using spin:

The first application of spintronics to computers saw Professors Albert Fert and Peter Gruenberg granted the 2007 Nobel Prize in Physics for their revelation of mammoth magneto resistance (GMR). They understood it was conceivable to utilize electron turn to expand the rate at which data could be perused from a hard disk drive and ground-breaking technology to tackle this component.

A hard circle drive stores information as ones and zeros encoded attractively on turning circle platters inside the drive. The attractive field is produced when electrons course through wire loops mounted in the drive compose heads which move over the essence of the platters, changing the arrangement of the magneto-touchy particles on the platter surface. Turning around the electron stream inverts the field; the two headings speak to one and zero. To peruse from the plate the procedure works backward.

A GMR drive head comprises of two ferromagnetic layers, one with a fixed magnetic field direction and the other allowed lining up with the magnetic field encoded on the disk, with a non-magnetic layer sandwiched in the middle.

At the point when an electron goes through a magnetic field it's spin state may change, known as dispersing. Where electrons have arbitrary, scattered spin expresses this makes more prominent protection from the electric flow. By adjusting electrons' spin state to that of the magnetic field in the layers of the drive head, GMR technology drastically reduces resistance, accelerating information move. First introduced by IBM in 1997, GMR technology has prompted quicker and higher-density drives than was already conceivable.

Putting a fresh spin on memory, Spintronics scientists have since been taking a shot at acquainting a similar technology with computer memory, intending to supplant electric

flow-based dynamic random access memory (DRAM) with magnetic RAM (MRAM). The first commercial product by Everspin has been utilized in Airbus airplane and BMW motorbikes because of its unwavering quality under heat stress or cosmic-ray exposure something that influences aircraft cruising at high altitudes.

MRAM exploits a similar spin-based magnetic field approach, yet utilizes a magnetoresistance cell to store information as opposed to a spinning disk platter as in a hard drive. While it isn't as quick as DRAM, magnetic cells can keep up their put away turn directions, thus the information they represent, without power. MRAM is probably going to replace commonly utilized flash memory, for example, SD cards and compact flash first, as it is faster and doesn't suffer from flash memory's limited lifespan.

Different producers, for example, Intel, Qualcomm, Toshiba, and Samsung are creating MRAM to use as processor store memory, whereby the excellence of their littler size MRAM chips of more prominent limit can be fused into littler bundles that will be quicker, and utilize around 80% less control than current reserve memory.

As electronics approaches the breaking points of silicon, spintronic components will assume a significant role in ensuring we appreciate steady performance gains, and quicker, higher-limit storage at lower power and cost.

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Fig: How Covid19 pandemic has changed the education system, forever

Faculty Article

Satellite communications – Latest Trends

Ms. L Sarika

Assistant Professor, Department of ECE

The 24th Annual Report of the State of the Satellite Industry (SSIR) stated that despite the pandemic, the space industry continued to grow, and in 2020 there was record-setting growth in satellite launches into orbit, other economic metrics, and investment in commercial space ventures.

It is reforming its space activities and operations by utilising technologies like 5G, sophisticated satellite systems, 3D printing, big data, and quantum technology.

Implementing advanced space technology is essential since numerous services rely on space infrastructures, such as weather forecasting, remote sensing, satellite television, and long-distance communication. Technological advancements are currently propelling space operations and research.

Here we have some new opportunities provided by artificial technology in the space industry and the most recent trends propelled by innovation.

Small satellites are gaining popularity: Small satellites have grown in popularity in recent years. Small satellites are launch by space technology firms to enable scientists to perform research and missions that bigger satellites cannot.

Miniature size satellites encourage firms to mass-produce and enable cost-effective designs. Small satellites have been launch by many firms, including Planet, Hawkeye, BlackSky, and Swarm.

Enhancing Advanced Communications: Space communications have always depended on a transmitter and a receiver. Recent advances in space communication technology have extended beyond receivers and transmitters to enable advanced communication such as high-capacity antennas, base stations, and low-orbit satellites (LEO).

Companies like Thorium Space Technologies and Arctic Space Technologies are creating ground-breaking technologies to enable improved space communication.

Monitoring space data with technology

Many LEO satellites and multi-satellite constellations capture massive amounts of data regularly. It contains communication data, image material, and even spy information.

Because of the nature of space data, space technology firms are under pressure to handle, treat, analyse, and manage it correctly using disruptive technologies such as artificial intelligence, block chain, and big data.

New initiatives to clear up space junk

After years of launching countless rockets and carriers into space, humanity is now seeing the resulting congestion. Space agencies have been leaving out rocket stages, errant bolts and paint chips, solid-rocket-motor slag, dead or dying satellites, and scattered fragments from antisatellite experiments in outer space for more than a half-century.

Fortunately, we have now recognised that worthless floating items may cause disasters to operating satellites or moving rockets. As a result, space technology firms are stepping up their efforts to clear up space junk. A space mission 'ELSA-

d' launched to collect space trash scattered throughout the universe in millions of pieces.

The start of the "reusable rocket" era: Rockets are not cheap. Everything is expensive, from the raw ingredients to the coatings utilised. While rockets cost millions of dollars, they can only be launch once. It has been the most significant disadvantage for space organisations. However, that altered when private businesses were permitted to experiment with space technology innovation.

Today, space technology firms such as SpaceX and Blue Origin developing reusable rockets that save money and time. The Falcon 9 rocket from SpaceX is a two-stage rocket designed for cargo delivery and human flight. Blue Origin has also launched the reusable 'New Shepard rocket' to the edge of space.

The satellite communication industry is evolving, as evidenced by numerous trends that one can expect to see on the horizon over the coming 18 months and beyond.

The increase in small satellites, the use of low-Earth orbit (LEO), launches on reusable rocket launch vehicles and new use cases for 5G and the Internet of Things (IoT) are some of the most important developments to watch.

'Satellite technology has the potential to be a strong player in Internet of Things (IoT) connectivity, along with "connecting the unconnected."' – Tony Pallone, Writer and Editor, IEEE GlobalSpec

As satellite technology continues to expand into the connectivity landscape, perceptions of it being prohibitively expensive, plagued by high latency and having limited bandwidth are starting to shift.

Satellite technology has the potential to be a strong player in Internet of Things (IoT) connectivity, along with "connecting the unconnected" in parts of the world where alternative communication paths, at present, simply do not exist.

1. SmallSats get big:There's a general benchmark that small satellites, or SmallSats, are satellites under 500 kg, yet definitions vary, and there are several subcategories. There is little question, however, that the population of SmallSats overall is currently in the process of exploding, as evidenced by numerous recent forecasts, including Future Market Insights and Research and Markets.

Bill Menezes, a Gartner analyst covering wireless services, offers one reason: SmallSats can be constructed and launched less expensively and more quickly than traditional, large, geosynchronous orbit satellites.

To be sure, there are limits to SmallSat capabilities, both in terms of transmission power and capacity for supporting bandwidth. More important than the size of a given satellite, however, is its placement in space – and this is where SmallSat constellations launched into LEO have the potential to be what Menezes calls a game-changer.

2. LEO lessens latency: LEO is defined by NASA as the first 100 to 200 miles of space above the planet. SmallSat LEO constellations represent an example of the old adage about the whole being greater than the sum of its parts. By working together close to the ground, the satellites address one of the most significant limitations of geosynchronous systems: high latency.

'The perception that satellite technology is incapable of providing low-latency connectivity is beginning to shift.' – Abel Nevarez, IHS Markit research analyst

According to IHS Markit research analyst Abel Nevarez, latency was reported as one of the most critical issues in a 2017 IHS Markit survey of mobile operators. However, Nevarez says, the perception

that satellite technology is incapable of providing low-latency connectivity is beginning to shift as more responsive systems come online.

Perhaps the best-known LEO system currently in operation, as Menezes points out, is the Iridium constellation. It is aimed primarily at voice communication service through 66 satellites providing pole-to-pole coverage.

Other companies are now in the planning and testing stages for deploying far greater numbers of satellites into LEO that will enable them to move into a largely untapped area for the technology: providing low-latency broadband with pervasive connectivity.

OneWeb plans to launch at least 900 satellites, with broadband access to begin as early as 2019; SpaceX, with its Starlink constellation comprised of nearly 12,000 satellites, is slated to begin operation as early as 2019 or 2020.

By addressing the needs of applications requiring more bandwidth and lower latency, Menezes adds, this kind of development can have a positive effect on the industry overall.

"Then you have competition," he explains. "You have a huge amount of capacity that is then in service that helps maybe drive prices down, and makes it an alternative – even in areas where you (already) have terrestrial network connectivity that's sufficient to serve those needs."

3. Reusable rockets fuel deployment: The outlook for LEO systems hasn't always been so sunny, says Dimitris Mavrakis, research director of telecom networks at ABI Research. At one point, Iridium went bankrupt due to the launch costs involved in its attempt to create an LEO constellation that could address the latency issue.

"There's still a relatively limited number of companies that do these launches," Mavrakis adds.

'Satellites can offer advantages for mobile infrastructure backhaul and underserved-area connectivity.' – Nevarez

Launch vehicle innovations, such as SpaceX's reusable rocket system Falcon 9, have reignited interest in LEO. Iridium is now in the process of rolling out its broadband Iridium Next constellation, using SpaceX as a launch provider.

Menezes also notes the potential for reusable rocket launch vehicles to be a driving factor in SmallSat growth; the small payload means that a launch vehicle can deliver them in large quantities. Moreover, satellites from more than one company can hitch a ride on a single launch.

4. 5G ecosystems receive support: It's important to note that some of the numbers being tossed around as service providers discuss their 5G rollout plans — things like multiple gigabits per second of data throughput, and latency less than 1 millisecond — cannot be achieved by present satellite technology.

Still, Menezes says, there is a potential role for satellites in the development of 5G networks because many providers are looking at coverage "ecosystems" — heterogenous networks that might include elements such as LEO broadband satellites for backhaul.

Satellites can offer advantages for mobile infrastructure backhaul and underserved-area connectivity, including the lack of distance limitations and rights-of-way jurisdictions that are inherent to terrestrial networks, Nevarez says.

Such advantages may help to explain why multiple players are jumping on the satellite bandwagon. Nevarez offers the examples of Japanese

multinational SoftBank, which is using satellite backhaul to provide LTE service to remote regions, and Facebook, which is using satellite backhaul to provide Wi-Fi to areas in Africa.

Still, Mavrakis cautions that the value of satellite communications to 5G may be overstated by the satellite companies themselves, which are acting defensively in order to protect their assets. In order to roll out 5G connectivity, Mavrakis explains, telecom operators are looking to break into the C-band frequency range currently allocated for satellite communications.

The future of frequency allocations will be determined in late 2019, at the ITU's next World Radio Communication conference.

5. IoT access expands: In contrast to the healthy debate over the role of satellite communications in 5G, there is little argument that satellites can play a key role as building blocks for the Internet of Things (IoT).

"A lot of Internet of Things devices are going to be in locations that don't lend themselves to easy access from a terrestrial network," Menezes points out. "If there are 20 billion endpoints out there, most of which need some type of wireless connectivity . . . a fair amount of those are going to be in a use case where satellite is the best way of delivering that connectivity."

Indeed, although the coverage provided by cellular networks has expanded, there are still many places out of reach. This is especially true in developing regions, where coverage drops off quickly as one travels away from the primary roadways and into more remote areas. Both Menezes and Mavrakis agree that these types of coverage gaps create a strong IoT use case for satellites.

"There's a big enterprise use case to be made," Menezes says. He offers one example: a SmallSat with limited bandwidth could be used to monitor moisture sensors in a remote agricultural field. A steady stream of heavy data going back and forth isn't necessary; rather, it's sufficient for data to be collected a couple of times each day.

What comes next remains to be seen, but it's clear that satellite technology is on the rise.

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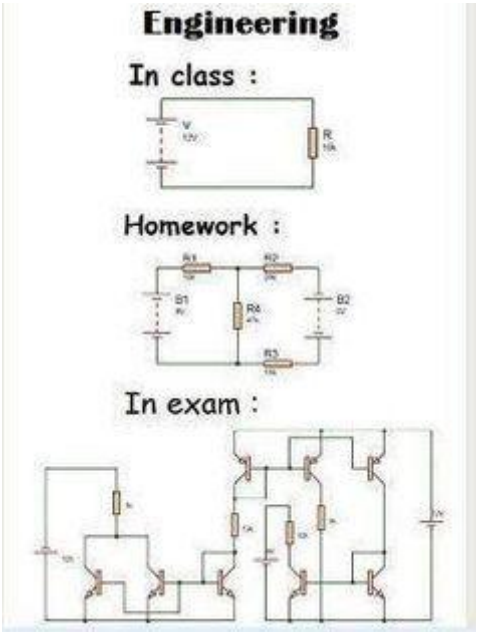

Student Article

BLOCKCHAIN TECHNOLOGY

D.Bhargavi – II ECE – 1 – 19JG1A0420

Blockchain technology is most simply defined as a decentralized, distributed ledger that records the provenance of a digital asset. By inherent design, the data on a block chain is unable to be modified, which makes it a legitimate disruptor for industries like payments, cyber security and healthcare. Our guide will walk you through what it is, how it's used and its history.

What is Blockchain?

Blockchain, sometimes referred to as Distributed Ledger Technology (DLT), makes the history of any digital asset unalterable and transparent through the use of decentralization and cryptographic hashing.

Fig: Working of Blockchain technology

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A simple analogy for understanding blockchain technology is a Google Doc. When we create a document and share it with a group of people, the document is distributed instead of copied or transferred. This creates a decentralized distribution chain that gives everyone access to the document at the same time. No one is locked out awaiting changes from another party, while all modifications to the doc are being recorded in real-time, making changes completely transparent. Block chain is an especially promising and revolutionary technology because it helps reduce risk, stamps out fraud and brings transparency in a scalable way for myriad uses.

Blockchain consists of three important concepts: blocks, nodes and miners.

Blocks:

Every chain consists of multiple blocks and each block has three basic elements:

- The **data** in the block.
- A 32-bit whole number called a **nonce.** The nonce is randomly generated when a block is created, which then generates a block header hash.
- The **hash** is a 256-bit number wedded to the nonce. It must start with a huge number of zeroes (i.e., be extremely small).
- When the first block of a chain is created, a nonce generates the cryptographic hash. The data in the block is considered signed and forever tied to the nonce and hash unless it is mined.

Miners:

Miners create new blocks on the chain through a process called mining.

In a blockchain every block has its own unique nonce and hash, but also references the hash of the previous block in the chain, so mining a block isn't easy, especially on large chains. Miners use

special software to solve the incredibly complex math problem of finding a nonce that generates an accepted hash. Because the nonce is only 32 bits and the hash is 256, there are roughly four billion possible nonce-hash combinations that must be mined before the right one is found. When that happens miners are said to have found the "golden nonce" and their block is added to the chain.

Making a change to any block earlier in the chain requires re-mining not just the block with the change, but all of the blocks that come after. This is why it's extremely difficult to manipulate blockchain technology. Think of it as "safety in math" since finding golden **nonces** requires an enormous amount of time and computing power.

When a block is successfully mined, the change is accepted by all of the nodes on the network and the miner is rewarded financially.

Nodes:

One of the most important concepts in block chain technology is decentralization. No one computer or organization can own the chain. Instead, it is a distributed ledger via the nodes connected to the chain. Nodes can be any kind of electronic device that maintains copies of the block chain and keeps the network functioning.

Every node has its own copy of the block chain and the network must algorithmically approve any newly mined block for the chain to be updated, trusted and verified. Since block chains are transparent, every action in the ledger can be easily checked and viewed. Each participant is given a unique alphanumeric identification number that shows their transactions.

Combining public information with a system of checks-and-balances helps the block chain maintain integrity and creates trust among users. Essentially, blockchains can be thought of as the scalability of trust via technology.

Fig: Isometric Blockchain Revolution Concept Stock Illustration

Tokens:

Programmers can create tokens to represent any kind of digital asset, track its ownership and execute its functionality according to a set of programming instructions.

Tokens can be music files, contracts, concert tickets or even a patient's medical records. Most recently, Non-Fungible Tokens (NFTs) have become all the rage. NFTs are unique block chain-based tokens that store digital media (like a video, music or art). Each NFT has the ability to verify authenticity, past history and sole ownership of the piece of digital media. NFTs have become wildly popular because they offer a new wave of digital creators the ability to buy and sell their creations, while getting proper credit and a fair share of profits.

Newfound uses for block chain have broadened the potential of the ledger technology to permeate other sectors like media, government and identity security. Thousands of companies are currently researching and developing products and ecosystems that run entirely on the burgeoning technology.

Block chain is challenging the current status quo of innovation by letting companies experiment with ground-breaking technology like peer-to-peer energy distribution or decentralized forms for news media. Much like the definition of block chain, the uses for the ledger system will only evolve as technology evolves.

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Student Article

UNHACKABLE INTERNET

K. Pratheeka – II ECE – 1 – 19JG1A0444

As the internet continues to penetrate all aspects of our modern lives, issues related to data protection, privacy and cyber security are becoming ever more pertinent.

Quantum powered internet:

Modern telecommunication networks utilise fibre-optic cables to transport internet. Fibre-optic cables enable high speed data connection by carrying light inside them. Recently, scientists began applying laws of quantum mechanics to transmit encoded information via pairs of photons across the same fibre-optic cables. As photons are a type of elementary particle that moves at the speed of light, they allow for quantum transmissions that are extremely difficult to eavesdrop on. The breakthrough was achieved with the use of 'entanglement' or the transmission of sub-atomic particles. When two particles become inextricably linked, changing the properties of one of them changes those of the other, regardless of the distance between them. In other words, entangled photons can't be covertly read (hacked) without disrupting their content. Scientists believe that this technology will form bases for virtually unhackable internet networks in the near future.

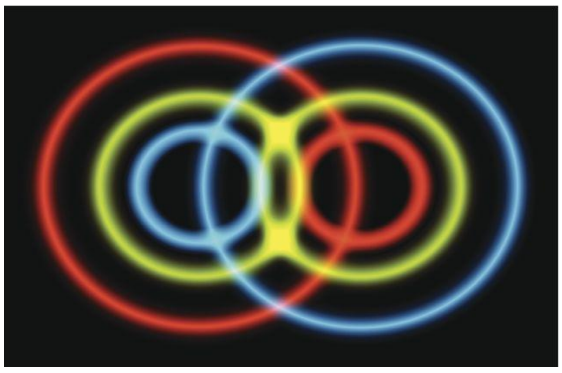

Fig: Unhackable Internet – Quantum Intenet

A new era of communications: As the technology uses existing fibre-optic cables, it is designed to run as a supplementary network, making it easier to introduce. Before a global roll out, quantum internet networks are planned to be used in the banking sector, health services, as well as in aircraft communication.

However, the technology has the potential of transforming communication systems in areas of science, industry and national security. It is also expected that in the future, the technology will be applied to personal mobile devices, making online interaction completely private. In recent years there has been concentrated research on the possibilities and power of quantum computing. Yet, even though we are still far away from implementing this technology in our computers or mobile devices, the idea of quantum networks powering the internet is within our reach. Researchers believe that an unhackable global quantum internet networks may start to materialise by the end of the decade.

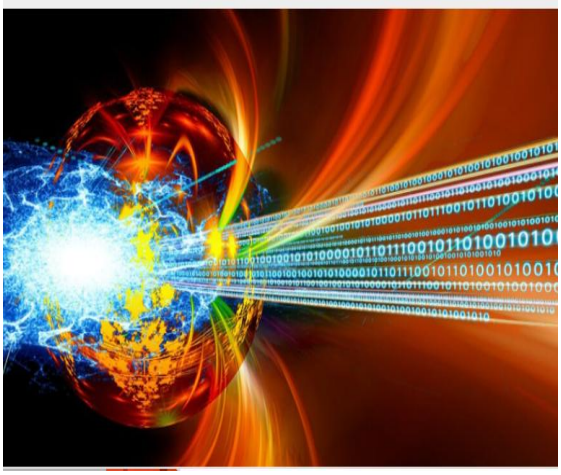

Fig: America is on the verge of developing an "Unhackable" Quantum Internet

https://images.app.goo.gl/5HFfT5txSjg3shsW9

The U.S. Department of Energy (DoE) has announced a plan to make a quantum internet it says is virtually unhackable. This is definitely a long-term plan that will require new kinds of engineering and technology, not something that will be implemented next year. Let's take a look at the concept, the plan the DoE has laid out, and how long it all might take.

Within the framework of quantum mechanics, the network proposed here is pretty intuitive. (That's a big caveat, though!) The report begins with a surprising notion: Although headlines and research have focused on the power of quantum computing, we're far away from any practical and recognizable computer powered by quantum phenomena. The idea of a quantum network, the DoE says, is far closer to our reach.

You like quantum. We like quantum. Let's nerd out together.

Think of how rapidly fiber optic internet increased our connection speed capacity while computers have remained basically the same. Having a firehose-sized bandwidth can harmonize with great up-to-date hardware to improve the entire experience, letting people stream HD video and more onto hardware that could often already do it. And a quantum internet could rapidly increase even over high fiber speeds.

How will a quantum link make this happen? The DoE explains in a statement:

"It works through two quantum phenomena: the first is quantum entanglement, where two particles can become so inextricably linked that no matter how much distance separates them, changing the properties of one will change those of the other. And since that communication happens instantly, a quantum internet could be much faster than today's networks."

"The second phenomenon is quantum superposition, where a particle can exist in two different states at once," the DoE continues. "This is what enables tighter security of the information shared across a quantum network. Information is encoded into entangled pairs of photons, in a superposition of states—in data terms that means they represent both a one and a zero at the same time." (Keen-eyed hardware observers know that quantum encryption was one of the foremost suggested applications of the technology.)

Quantum internet: The race is on to build an unhackable online world

Great leaps are already being made in creating a super secure quantum internet. It could overturn the role of information in our lives and give us a globe-spanning quantum supercomputer.

Fig: Future of internet

MANY of us have uploaded our lives to the internet. Banking, work emails, social media, dating profiles, medical records – all that vital, sensitive information. So it is a little disconcerting that the internet has a fatal security flaw. Don't panic; our private information is safe for now. But before very long the encryption algorithms that protect us online are going to crack.

That is the urgent driving force behind a new, more secure kind of internet that harnesses the

power of the quantum realm. Once up and running, the system will be able to do a lot more than protect our data. It could bring us unforeseen quantum apps, and maybe become the scaffold for a world-spanning quantum computer of incredible power.

Building the quantum internet is a huge and multi-faceted engineering challenge, but the foundations are already being laid. Networks of fibres are spreading. Scientists are chatting in secret on local networks. There are even plans to use tiny satellites to enable long-distance quantum connections. Sooner or later, we could all be joining the quantum information superhighway.

Human culture and industry have long been based on information. If you could get the right kind of information, understand it and share it, you could gain power and profit. The rise of the internet as we know it cemented the role of information and we are only beginning to feel its profound effects. Now we are at the threshold of a new information age, which could change things all over again.

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https://www.google.com/url?sa=t&source=web&rct=j&url=https://www.abgi-uk.com/blog/unhackable-internet/&ved=2ahUKEwjTk_nj37v2AhX4UGwGHV2jBYAQFnoECDkQAQ&usg=AOvVaw2xJQSMVF755Ce43So5veh-

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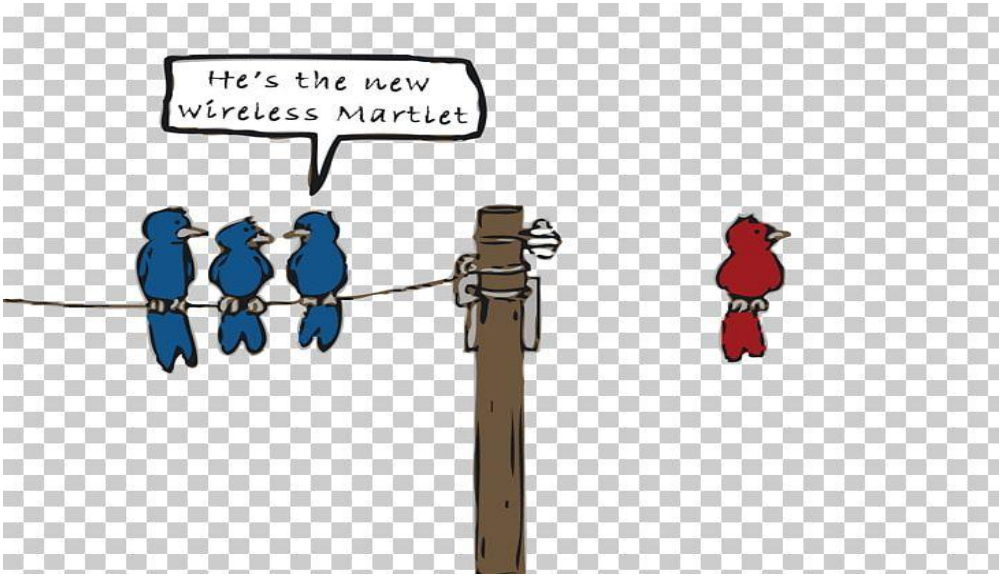

Student Article

VOICE TECHNOLOGY

A.Sameera – II ECE – 1 – 19JG1A0402

Voice technology has been gaining steady popularity in recent years, from smart speakers in homes to voice control in cars. The COVID-19 pandemic was a catalyst that skyrocketed voice technology's prominence, with almost 40% of the U.S. population using smart speakers monthly in 2020. Voice technology adoption grew in 2020 due to its contactless appeal and now, as we move into the inoculation phase of the pandemic, brands are realizing that consumers aren't willing to give up the convenience voice technology offers moving forward.

As people continue to expect the ease and convenience of voice-enabled interactions, companies should think about developing and deploying a conversational-first strategy to create deeper relationships with customers. Digital voice technology can help Companies Bridge the gap between their products and services to their most important consumers.

To build a successful digital voice strategy, companies need to first understand what digital voice is, and how they can use it to their advantage.

What is digital voice?

With 61 percent of adults who already use a voice assistant reporting that they will use it more frequently in the future to complete tasks like making purchases or adding items to a shopping list, companies have an opportunity to meet people on these devices. However, companies can go beyond the voice assistants built into smart speakers to create a unique voice that speaks to the company's brand and sets them apart from the uniform sound of an assistant's voice. Custom digital voices can be deployed across different devices and touch points to create a seamless experience across the entire consumer journey and increase brand recognition. Similar to visual branding collateral, the voice a brand leverages must be instantly identifiable, engaging, memorable, and consistent between devices and platforms. When consumers hear the same voice—no matter the device or platform—they trust the brand more and develop an emotional connection, which is key for brands as voice technology continues to grow.

To optimize digital voices, companies need to choose the right voice partner. Ideally, the company will choose a partner that guarantees data privacy, commits to quality assurance, and uses the most effective technology available, so that the company can create the best experiences possible for consumers while guaranteeing their privacy.

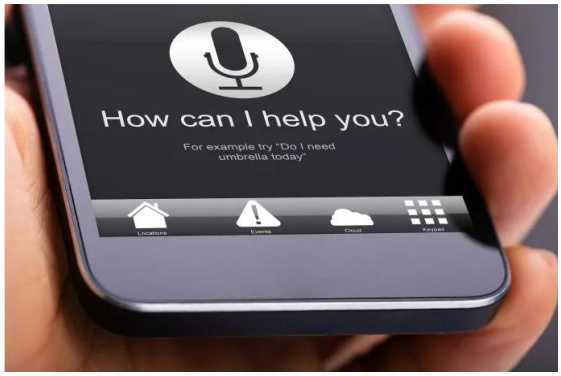

Fig: https://i0.wp.com/bdtechtalks.com/wp-content/uploads/2019/03/mobile-voice-assistant.jpg?ssl=1

The technology powering next-gen digital voice

As consumers become accustomed to more natural-sounding voices, companies need to

ensure that the voices they're deploying meet their standards. To be effective, companies should deploy technologies such as natural language understanding (NLU), conversational artificial intelligence (AI), and neural text-to-speech (TTS). Together, these technologies enable voices to sound more humanlike, as opposed to the voices found in smart assistants today. NLU, which enables machine reading comprehension, can be applied to tasks such as short-spoken commands, or highly complex tasks like comprehending entire news articles. It powers conversational AI to recognize speech and text inputs to translate their meanings across languages. Combining these technologies with neural TTS, companies can produce synthesized speech from text that sounds like a human voice and can respond more appropriately to consumer grievances and questions.

For example, many automakers are embedding voice solutions into their GPS, navigation, and telematics systems, which can be used for outbound communications between an automaker and the driver. If an automaker is trying to warn a driver about safety hazards, they can deploy a voice that is more sympathetic. However, if the automaker is communicating a scheduled service reminder at a dealership, it wouldn't make sense to use the same voice as the safety hazard warning voice. Instead, the automaker could deploy a more upbeat voice when communicating the reminder. With the help of NLU, AI, and TTS, automakers can deploy different voices depending on each consumer's situation.

With different voices at their disposal, companies can create better, more engaging experiences for consumers that increase loyalty and deepen consumer trust.

Fig: https://www.analyticsinsight.net/top-voice-technology-trends-in-2021-to-give-your-attention-to/

Up levelling the consumer experience:

While voice technology has been widely used to increase web accessibility for the visually impaired, as well as in niche use cases like GPS devices for vehicles, companies across multiple industries, such as retail, travel, and hospitality, are realizing the benefits of the technology and are using it to provide superior, personalized customer experiences to interact with consumers by deploying different voices based on the consumer's unique situation.

Once the voice is created, the technology can be adjusted and scaled, so companies can modify scripts, maintain a consistent brand voice and add new ways to keep consumers engaged. This way, companies don't have to depend on a voice actor's availability or health or cover their recording costs each time they want to make an adjustment to their custom voice, allowing them to deploy voice updates immediately as they are made.

Scalability is crucial to deploying different voices given the different reasons consumers interact with voice technology. In the wellness industry, companies can encourage people to exercise, stay hydrated, and take medication, all of which could

be communicated in an upbeat and friendly tone. Companies can also remind people to meditate, for which an upbeat tone may not work as well. Instead, the company can deploy a calming voice in different languages to help users get in the right mindset.

As voice technology grows more popular and people continue to demand ease of use and convenience, brands can work on creating a digital voice now to meet consumer preferences. By using digital voices that capture the unique brand persona, companies can better engage their most important customers, provide better customer service and offer superior experiences.

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https://www.google.com/url?sa=t&source=web&rct=j&url=https://www.analyticsinsight.net/top-voice-technology-trends-in-2021-to-give-your-attention-to/&ved=2ahUKEwjS1sv05Lv2AhV8wzgGHQPLCR8QFnoECHUQAQ&usg=AOvVaw1CY1JQ9rCjoP81LJgJ_zT8

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16JG1A0465	8.60
16JG1A0449	8.56
16JG1A0494	8.53
16JG1A0480	8.52
16JG1A04A6	8.47
16JG1A0491	8.37

Student Article

AUTONOMOUS DRIVING

A.Divija – III ECE – 1 – 18JG1A0409

10 million autonomous vehicles will hit the roads by 2020. In 10 years fully autonomous vehicles will be the norm. AVs will generate a $7 trillion annual revenue stream by 2050. Widespread adoption of AVs could lead to a 90% reduction in vehicle crashes.

Key Physical Components of Autonomous Vehicles

Cameras – Provide real-time obstacle detection to facilitate lane departure and track roadway information (like road signs). Radar – Radio waves detect short & long-range depth. LIDAR – Measures distance by illuminating target with pulsed laser light and measuring reflected pulses with sensors to create 3-D map of area. GPS – Triangulates position of car using satellites. Current GPS technology is limited to a certain distance. Advanced GPS is in development. Ultrasonic Sensors – Uses high-frequency sound waves and bounce-back to calculate distance. Best in close range. Central Computer – "Brain" of the vehicle. Receives information from various components and helps direct vehicle overall. DRSC - Based Receiver – Communications device permitting vehicle to communicate with other vehicles (V2V) using DSRC, a wireless communication standard that enables reliable data transmission in active safety applications. NHTSA has promoted the use of DSRC. January 2017 – Keolis and NAVYA, in partnership with the city of Las Vegas, launched the first autonomous, fully electric shuttle to be deployed on a public roadway in the United States. January 2018 – Toyota announces "e-Palette" concept vehicle which is a fully electric autonomous vehicle that can be customized by a partner for applications such as food deliveries (Pizza Hut), ride-sharing (Uber), or store fronts (Amazon). January 2018 – Udelv, a Bay Area tech company, completed the first delivery of goods by a self-driving car when it delivered groceries in San Mateo. February 2018 – Hyundai announced that a fleet of its fuel cell electric cars made a successful fully automated trip from Seoul to Pyeongchang. This is the first time a Level 4 car has been operated with fuel cell electric cars.

Fig: https://www.google.com/search?q=autonomous+driving+technology&client=ms-android-oppo-rev1&prmd=niv&sxsrf=APq-WBvpNlDj1_CcBefNmvykCzXS-ET66g:1646934984427&source=lnms&tbm=isch&sa=X&ved=2ahUKEwj359v1jrz2AhW3S2wGHedaD5cQ_AUoAnoECAIQAg&biw=360&bih=648&dpr=3

Legal issues around autonomous vehicles

- Regulations
- Liability
- Personal Injury
- Cyber security an data breaches
- Intellectual Property ownerships

Federal Regulation of Autonomous Vehicles:

Federal Motor Vehicle Safety Standards are the National Highway Traffic Safety Administration (NHTSA) within the Department of Transportation (DOT) specifies minimum safety performance requirements for motor vehicles and equipment. Automakers must certify compliance before selling vehicles. Fully autonomous vehicles (and some highly autonomous vehicles) would not meet current Federal Motor Vehicle Safety Standards (FMVSS) (i.e., if manufacturers seek to design vehicles without mirrors, bumpers, braking pedals, and other featured required by the FMVSS). NHTSA can approve a limited number of exemptions from the FMVSSs. NHTSA also can approve importation of autonomous vehicles that do not meet FMVSSs for testing, subject to conditions.

DOT released new guidance on autonomous vehicles in September 2017, titled "Automated Driving Systems (ADS) 2.0: A Vision for Safety". Replaces guidance issued in 2016 by Obama DOT. Guidance identifies 12 safety elements: (1) system safety; (2) operational design domain; (3) object and event detection and response; (4) fallback (minimal risk condition); (5) validation methods; (6) human machine interface; (7) vehicle cybersecurity; (8) crashworthiness; (9) post-crash ADS behaviour; (10) data recording; (11) consumer education and training; and (12) federal state and local laws. Recommends that entities involved in ADS testing and deployment demonstrate how they address the 12 safety elements by publishing a Voluntary Safety Self-Assessment.

NHTSA, the Federal Highway Administration (FHWA), and the Federal Transit Administration (FTA) have sought comments related to autonomous vehicles. NHTSA requested comments on regulatory barriers to Automated Safety Technologies, and testing and compliance certification. FHWA requested comments on what is needed to accommodate ADS technologies and maximizing their potential benefits in the transportation network. FTA requested comments on current and near-future status of automated transit buses and related technologies, with the goal of informing FTA's efforts to promote development of ADS in the public transit sector.

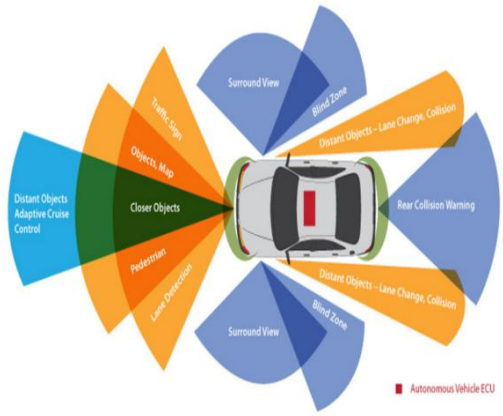


Fig:

https://www.google.com/search?q=autonomous+driving+technology&client=ms-android-oppo-rev1&prmd=niv&sxsrf=APq-WBvpNlDj1_CcBefNmvykCzXS-ET66g:1646934984427&source=lnms&tbm=isch&sa=X&ved=2ahUKEwj359v1jrz2AhW3S2wGHedaD5cQ_AUoAnoECAIQAg&biw=360&bih=648&dpr=3

State Laws Governing Autonomous Vehicles

23 states and the District of Columbia have passed legislation governing autonomous vehicles (Alabama, Arkansas, California, Colorado, Connecticut, Florida, Georgia, Illinois, Indiana, Louisiana, Michigan, New York, Nevada, North Carolina, North Dakota, Pennsylvania, South Carolina, Tennessee, Texas, Utah, Virginia, Vermont, and Washington D.C.). 10 additional states have executive orders in place issued by their governors relating to autonomous vehicles

(Arizona, Delaware, Hawaii, Idaho, Maine, Massachusetts, Minnesota, Ohio, Washington, and Wisconsin). Arizona, California, Florida, Michigan, and Nevada have been most active.

Liability for Autonomous Vehicle Accidents Will courts l treat autonomous vehicles as drivers and applies a negligence standard or as sophisticated technology and apply a product liability standard? How will liability be apportioned? Fleet Operator/Service Providers Vehicle manufacturers. Technology companies/software manufacturers. Local government's responsible for maintaining infrastructure.

Fig:

https://www.google.com/search?q=autonomous+driving+technology&client=ms-android-oppo-rev1&prmd=niv&sxsrf=APq-WBvpNlDj1_CcBefNmvykCzXS-ET66g:1646934984427&source=lnms&tbm=isch&sa=X&ved=2ahUKEwj359v1jrz2AhW3S2wGHedaD5cQ_AUoAnoECAIQAg&biw=360&bih=648&dpr=3

Product Liability: State Laws Florida, Michigan, Nevada and the District of Columbia shield manufacturers from liability for damages resulting from third party conversion of vehicle into autonomous vehicle, except where damages are caused by defect present in vehicle as originally manufactured.

Managing Liability Among Parties Warranties and indemnifications should clearly define scope, responsibility and liability. Responsibility for maintenance, repairs and updates should be defined. Liability between automaker, technology company and vehicle owner/operator should be defined. Responsibility for compliance with federal, state and local laws and regulation should be defined.

Potential Attack Gateways Electrical Control Units (ECUs) . Airbag, Advanced Driver Assistant System, Engine, Steering & Brakes, etc. On-Board Diagnostics (OBD) II Diagnostic Port . Dedicated Short-Range Communications-Based Receiver . USB Ports. Passive Keyless Entry/ Remote Key . Remote Link Type App. Tire Pressure Monitoring System.

REFERENCES:

https://www.google.com/search?q=autonomous+driving+technology&client=ms-android-oppo-rev1&prmd=niv&sxsrf=APq-WBvpNlDj1_CcBefNmvykCzXS-ET66g:1646934984427&source=lnms&tbm=isch&sa=X&ved=2ahUKEwj359v1jrz2AhW3S2wGHedaD5cQ_AUoAnoECAIQAg&biw=360&bih=648&dpr=3

Know a Scientist:

Martin (John) M. Atalla

US Patent No. 3,206,670

Inducted in 2009

Born: August 4, 1924

Died: December 30, 2009

John Atalla is one of the inventors of the metal-oxide-semiconductor field-effect transistor (MOSFET), the most widely employed type of integrated circuit.

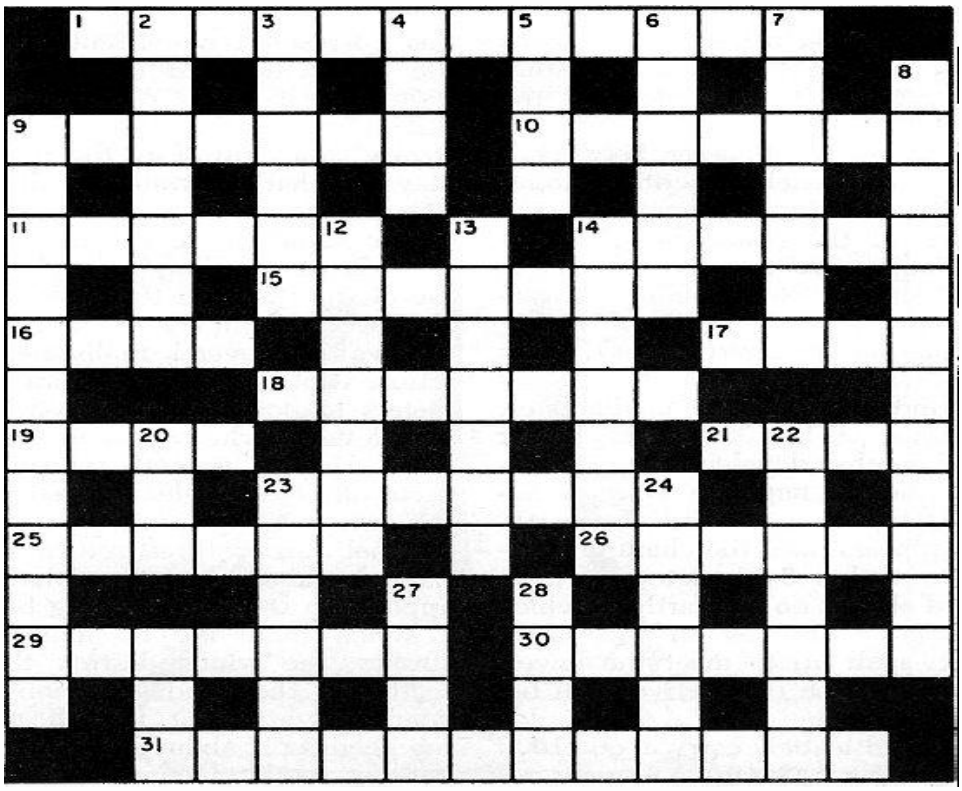
Born in Port Said, Egypt, Atalla came to the United States for graduate studies at Purdue University. After receiving his Ph.D. in 1949, he joined Bell Laboratories to investigate the surface properties of silicon semiconductors. By adopting a method of growing a layer of silicon dioxide on top of a silicon wafer, Atalla was able to overcome the surface states that prevented electricity from reaching the semiconducting layer. This is known as surface passivation, a critical step that made possible the ubiquity of silicon integrated circuits.

Atalla then suggested that a field effect transistor first envisioned in the 1920s and confirmed experimentally in the 1940s but not yet achieved be built of metal-oxide-silicon. Atalla assigned the task to Dawon Kahng, a scientist in his group. Atalla and Kahng announced their successful MOSFET at a 1960 conference.

In addition to Bell Labs, Atalla also worked for Hewlett-Packard and Fairchild Semiconducter. He later developed the data security system that is used in most automated banking machines. He founded several companies, including Atalla Corp., A4 Systems, and TriStrata.

Student corner:

Cross word:



Across	**Down**
1. Used a lot with hi-fi tubes, but rarely with hi-f transistors. 9.Cells in series. 10. Avoid this class of radiation. 11. Pre-radio astronomy apparatus which illustrated the planet positions. 14. What you may hear when the n.f.b. goes positive. 15. Condition of the overlong pot shaft. 16. 1000 cycles, this Hz!	2. Applies to mono disc recording. 3. What the yoke does to the beam. 4. Alcoholic radical and gets dopey with acetate. 5. A volt is one. 6. Scruffy appearance of the jack board? 7. Ten ions in stress. 8. A neon checker will perform these with capacitors. 9. Circuit presentation for squares?

17.It's a grabber.

18. Boozy sort of permanent magnet.

19. Diminutive devils.

21. Merely a component.

23. This gives the micrometer its final resolution.

25. Parish lands hidden in the dingle beside the church.

26. Minuet, polka, or bugaloo.

29. Sounds like Noah's nameplate, but is really the inverse of the sine.

30.Lags.

31.To put excessive audio into the final.

12. A pair for vertical deflections.

13. Just a moment!

14. Fate of disc on badly adjusted auto-changer?

20. Loud passage faintly evident in preceding groove.

22. This mariner of old had a nice tan.

23. City of blinding TV interference?

24. The field in a d'Arsonval meter air-gap.

27. A very feminine sort of wave.

28. The board is this with copper.

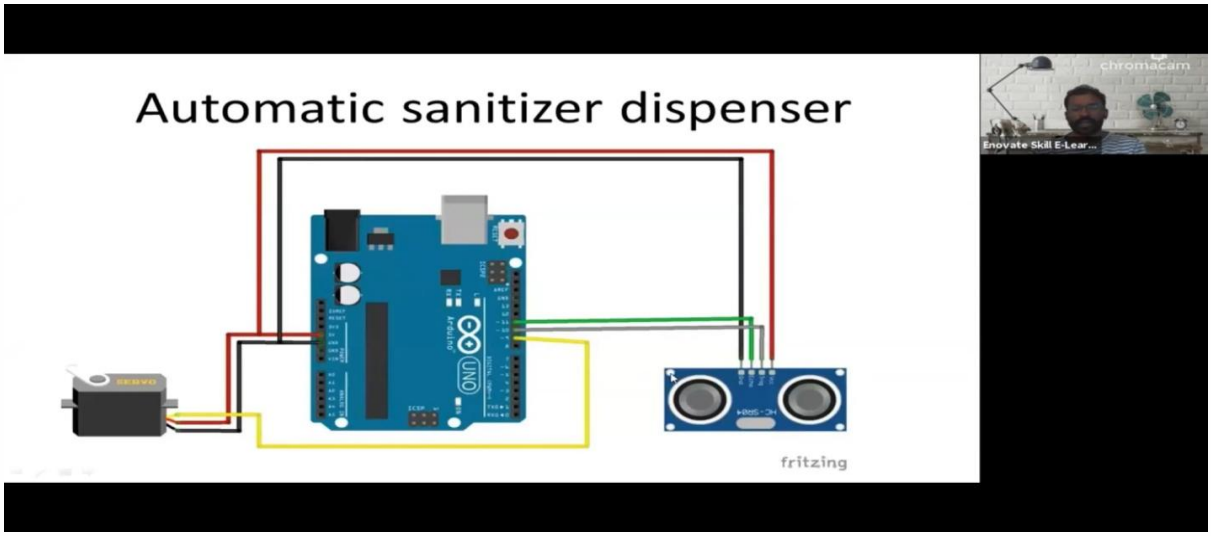
Answer to the Puzzle:

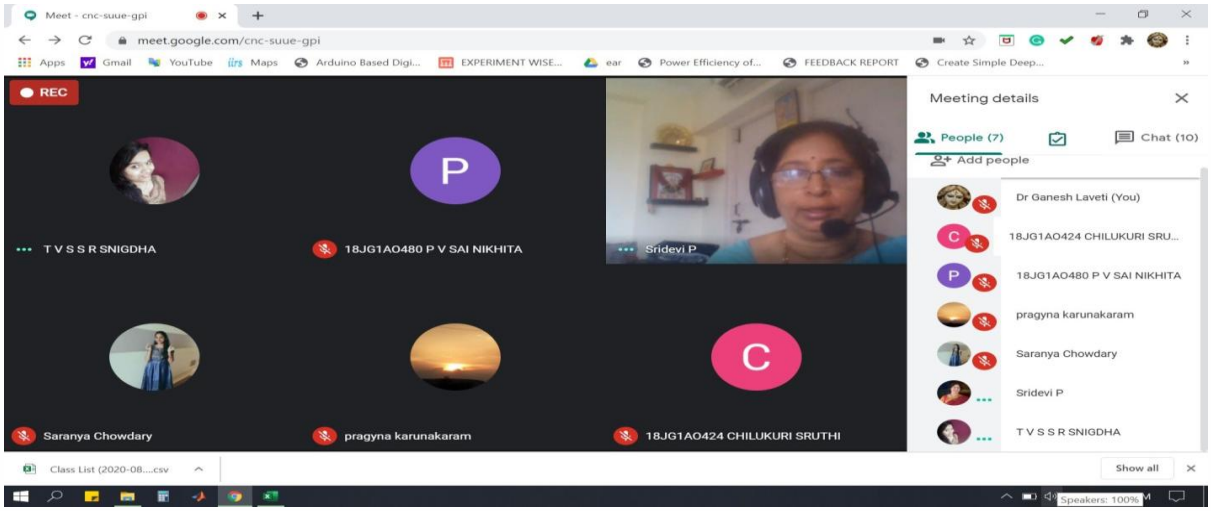
Department Activities:

1. The Department has organized A Technical Webinar on "**VLSI Design and Verification**" on 3rd June 2020, from 10-30 a.m to 01.00 p.m. Mr. Nagendra Bandi, Senior Application Engineer, CoreEl Technologies (I) Pvt. Ltd., Banglore is the resource person.
2. Department has organized A Guest Lecture on "**Evolution of new Mobile Technologies**" from 11:00 AM to 01:00 PM, 26th June 2020 in association with BSNL Visakhapatnam.
3. A 5-Day Hands-on Workshop via Online Mode. Fight Covid-19 using **"IoT"** 6th July to 10th July 2020, in association with Enovate Skill a unit of Enovation Lab LLP, Chandigarh, resourse person: Mr. Ajay Kumar Godara, Director Enovation Lab LLP, Chandigarh, coordinators of the workshop: Dr.L.Ganesh, Mr.P.V.K.Chaitanya.
4. A free technical webinar on **Industrial Automation** by Mr.Ajit Kumar Patro Executive Engg (E&A) in Jindal Stainless Ltd, Jajpur. Senior Engineer in Design Tech Systems Pvt Ltd, Pune on 15th July 2020 is organized in association with CENTRE OF Excellence in Maritime & Shipbuilding (CEMS).
5. The Department of ECE has conducted a Webinar on the topic " **Campus to Corporate** " in association with ICFAI Business School (IBS) on 29.08.2020 (Saturday) from 10AM to 11:30AM.
6. A Technical Webinar on "**Industrial IoT & AI/ML Job Opportunities**" in association with PHYTEC Embedded Pvt. Ltd. 24th September 2020, from 10:00 AM to 11:00 AM.
7. The ECLAT-A student association of ECE has conducted a Webinar on "**From Campus to Corporate**" on 31-10-2020. The recourse person Mr.B.Srinivas, Senior Vice-President, VE Commercial vehicles.
8. The ECLAT-A student association of ECE has conducted **TECHNICAL QUIZ** On the occasion of " WORLD TELEVISION DAY 2020" on 21/11/2020 from 4:00PM to 5 :00 PM.

Activities by IEEE STUDENT BRANCH, GVPCEW (1st January 2020 - 31st December 2020**)**:

S.No.	Date	Activity	No. of Students attended
1.	07-01-2020	IEEE Membership Awareness Meeting	42 (CSE:08 IT:6 ECE:18 EEE:10) IEEE & Non IEEE
2.	06-07-2020 To 10-07-2020	Five Day Workshop on Fight Covid-19 Using "IOT" By Mr. Ajay Kumar Kodar, Enovate Skills Lab	20 ECE IEEE Only
3.	14-07-2020	IEEE SB Officer-Elections	27 (ECE:20)IEEE Only
4.	29-08-2020	IEEE Student Member Interactive Meeting -7	03 (ECE) IEEE Only
5.	05-09-2020	IEEE Student Member Interactive Meeting -8	23 (ECE:15)IEEE Only
6.	29-09-2020	ELECTRO TECH- QUIZ	ECE (36)IEEE & Non IEEE
7.	24-11-2020	IEEE Student Body Interactive Meeting -9	ECE (03)IEEE Only
8.	30-11-2020	An introduction to the world of Machine and Deep Learning by Prof.Birendra Biswal, GVPCE (A)	ECE (10)IEEE & Non IEEE

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Saranya Chowdary
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Class List (2020-08....csv
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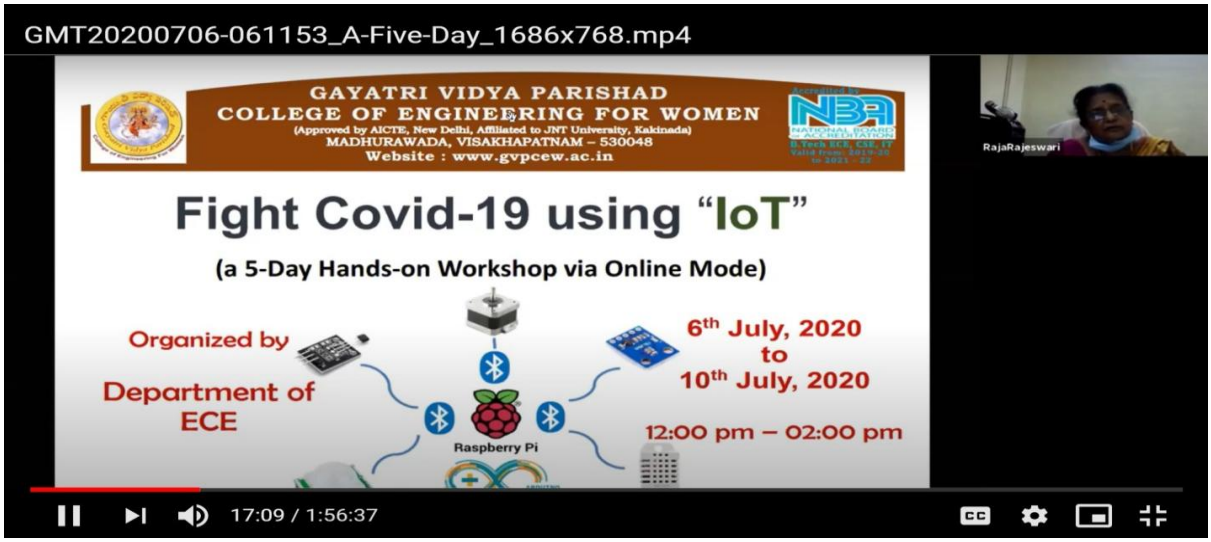
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(a 5-Day Hands-on Workshop via Online Mode)
Organized by
Department of ECE
Raspberry Pi
6th July, 2020
to
10th July, 2020
12:00 pm – 02:00 pm
17:09 / 1:56:37

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