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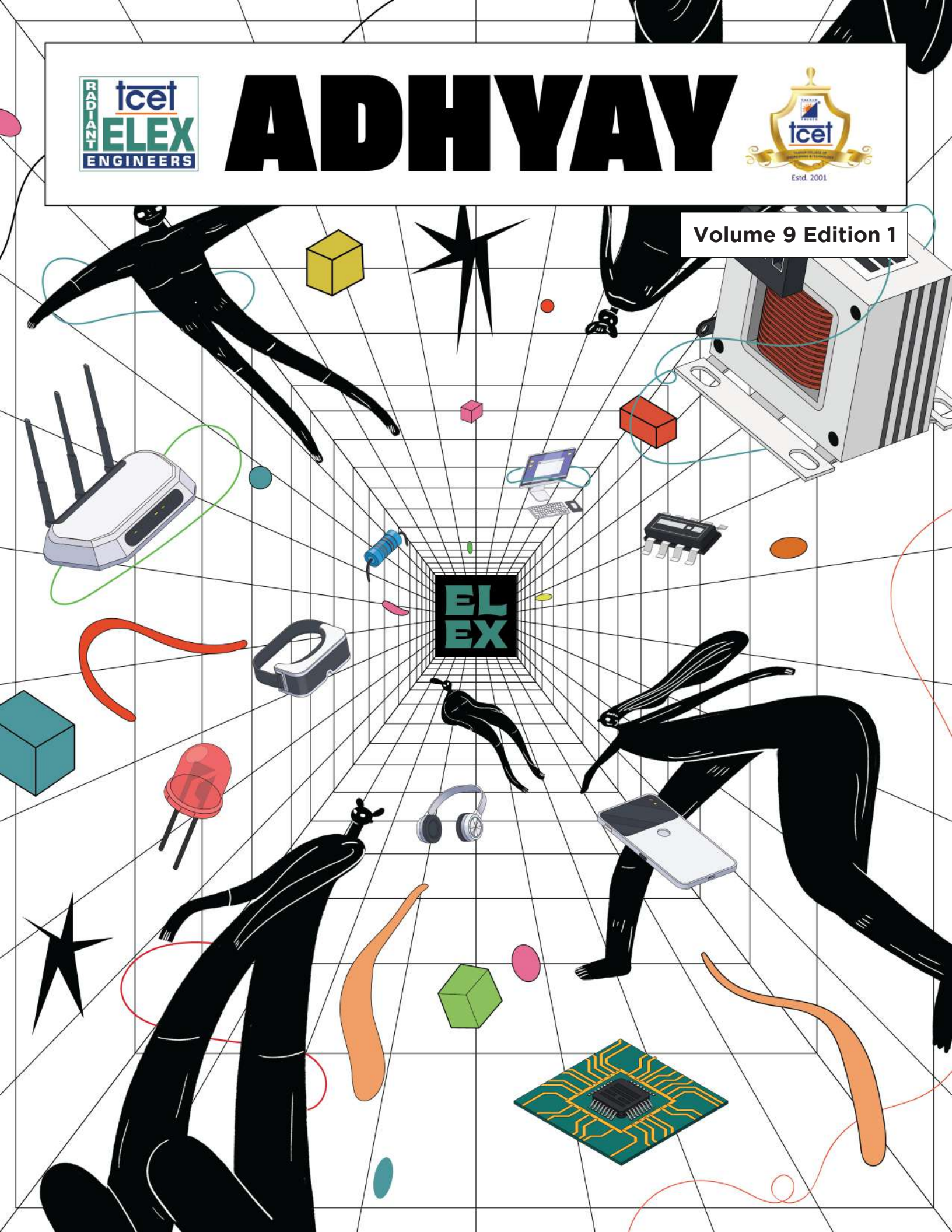


DEPARTMENT OF ELECTRONICS ENGINEERING

VISION

"*Department of Electronics Engineering (ELEX) will strive to achieve academic excellence in electronics and electronics related technical education in University of Mumbai to develop internationally competent professionals with a sense of responsibility and social sensitivity.*"

MISSION

To achieve academic excellence by creating the right ambience for nurturing and enhancing personal as well as professional skills that will enable students to compete globally.

PROBLEM SPECIFIC OUTCOMES

PSO1: To clearly understand the concepts and applications in the field of Electronics such as semiconductor technology, signal processing, embedded systems, communication etc. and acquire skills to Identify, formulate & solve problems in related fields of Electronics.

PSO2: To design electronics and computer-based components and systems for applications including signal processing, communication and control systems with the capability to comprehend the technological advancements with the help of modern design tools to analyze and design subsystems/processes for a variety of applications.

PSO3: To understand the impact of engineering solutions in a Global, Economic, Environmental, and Societal context and co-relate the learning to derive solutions to real world problems.

PSO4: To demonstrate skills to communicate in verbal and written form effectively and demonstrate the practice of professional ethics along with the concerns for societal and environmental wellbeing.

A MESSAGE FROM THE

HOD

DR. S.C. PATIL

The Electronics & Communication Engineering is one of the most dynamically changing and ever evolving branch since more than 100 years. Electronics is the foundation on which Information Technology and Computer Engineering has grown. Engineering with the latest tools such as VLSI Design, MATLAB , ARM CORTEX, LAB View, FPGA Board, to make students Industry ready. All high-speed networks and computers work on the hardware designed by electronic engineers. 21st century is the century of communication as communication engineering has been growing exponentially in recent years. At TCET, department of electronics Institute developed state-of–art laboratories & centres of excellence so as to train our students in Electronics Engineering through flexible, adaptive and progressive training programs, Bridge Courses, Various project in signal System and communication Domain and other Domains along with cohesive interaction with the research organizations, academicians and industries and having experience faculties in the department. It is my pleasure to work with imminent students who egger to develop the carrier in Electronics Engineering.

A MESSAGE FROM THE

FACULTY INCHARGE

VAIBHAV GIJARE

On Tuesday, December 8th, 2020, Margaret Keenan of Britain became the first person in the world to receive the Pfizer-BioNTech COVID-19 vaccine outside of clinical trials. This is the end, or at least the beginning of the end, of a very long and arduous journey. If nothing else, this marks a new beginning, with tens of millions of vaccine doses of the Pfizer-BioNTech vaccine becoming publicly available right away, multitudes more to follow as production continues to increase, and a half-dozen other vaccines come to market beyond that. The vaccine has already been shipped and stockpiled around the world. The distribution chains have been primed, prioritization groups defined, and the vaccine promotional campaigns have already begun. In the US, the FDA is expected to grant emergency-use authorization as soon as tomorrow and, according to Pfizer's CEO, the vaccine would be ready to ship "within hours." It will take time to bridge from now until we reach a state of wide-spread immunity to this horrible disease that has plagued us for so long. But it's time to start taking stock and planning for the future, which inevitably will occur. Some things will continue and may never go back to the way they were before. Others will dynamically shift as the world returns to normal in a post-COVID world. But one thing is certain, life will return to some resemblance of normal – and the time to start planning for it is now. Which is why this issue of our magazine is so important!

A MESSAGE FROM THE

IETE FACULTY INCHARGE

ARCHANA BELGE

As in today's world only bookish knowledge is not sufficient to stand oneself in the competitive word, we the Department of Electronics Engineering at TCET believe in overall development. We take care of the holistic development of students along with technical growth. We train students through various activities like Activity Based Learning (ABL); Project Based Learning (PBL); In-house Internship Programs, Workshops on upcoming technology and many more activities. In ABL we encourage students to develop their personality through various activities like debate, extempore, group discussions etc. In PBL students are guided to prepare projects by identifying real world problems and applying computing fundamental and technical skill to find solution to them. In-house Internship Programs are where students learn different coding languages which makes them industry competent... Professional Body activities are specially planned to make students ready for their professional career, through various activities like Workshops in looming technologies, Seminars, hands-on session up to date trend in Electronics, software and hardware in different platforms, industrial visits at various places to understand the upcoming requirements in industries. Professional Body is formed by the students for the students. The Electronics Department Faculty believes in Great teachers. "The mediocre teacher tells. The good teacher explains. The superior teacher demonstrates. The great teacher inspires." – William A. Ward

WORDS OF WISDOM

POORVA WAINGANKAR (ASSOCIATE PROFESSOR)

If you're trying to achieve something in your life, there will be obstacles. I've had them, but obstacles shouldn't stop you from going ahead. If you see a big wall in front of you, don't turn around and give up. Find a way out how to climb it, go through it, or break it... Life always comes with challenges, it's your choice whether to take it or leave it

SUNIL KHATRI (ASSISTANT PROFESSOR)

There are always people who just work hard and people who work hard smartly. In order to rise above all other competitors, your approach to any problem should be in a systematic manner so that there's clarity regarding what to do and with the extent of priority to be given as well. Hence my words of wisdom to all students are - "*Be smart in your work methodology & set your priorities straight*".

LEENA CHAKRABORTY (ASSISTANT PROFESSOR)

As a teacher, we do not only see our self as having the responsibility to teach and impart knowledge about different subject matters to our students; but, We also strive to motivate them to aspire to achieve excellence, and the best in whatever they do. Education is not a safety net. It is the rocket which will propel you towards success. All you have to do is have an aim and work on everything that takes to get a lift-off.

JALPABEN PANDYA (ASSISTANT PROFESSOR)

Education is not concerned with any ideology, nor is it based on any system, neither is it a mean of conditioning the individual in some special manner. Education in its true sense is helping the individual to be mature and free, to flower greatly in love and goodness. The highest function of education is to bring about an integrated individual who is capable of dealing with life as a whole.

SONAL BARVEY

In this day and age, where information is abundant and flowing in from all directions, the way forward is to broaden your perspective and expand your way of thinking. It is simply not possible to fit 20 litres of liquid into a container with a maximum capacity of 10 litres. Keep your conscience clear; at the end of the day, what matters most is how at peace you are with yourself. If you enrich your values, peace will come to you naturally!

SUJATA ALEGAVI

Excellence is never an accident, it is a result of high intension, sincere effort, intelligent direction, sincere effort, skillful execution, and the vision to see obstacles as opportunities.

CONTENT

TOTAL **49 PAGES**

Artwork by Holly Guacamolly

STUDENT ARTICLES

NON FUNGIBLE TOKENS (NFTs)

Mansi Vaghasiya & Maharshi Thakkar (SE ELEX)

Non-fungible tokens are the latest trend in the blockchain business (NFTs). They're proven to be an exciting offshoot of the crypto realm. But, with all kinds of news, you have to wonder how profitable it will be as a seller, buyer, or investor in the future. As a result, here's how these tokens will benefit you.

The NFTs became popular when two digital artists, Matt Hall and John Watkinson, performed Crypto Punks, which first became publicly available in 2017. They are as kind as digital photography - and they download beautiful peanut butter. In fact, CryptoPunk #3100 sold in March 2021 for a whopping $7.58 million. It is not the only NFT in the blockchain network that has fetched millions of dollars or, there are tons of NFTs selling at amazing prices

OWNERSHIP

In proof of ownership, the most important benefit of NFTs is apparent. Since NFTs are in a blockchain network, they can help connect ownership to a single account. The most significant fact of all the other data is that NFTs are indivisible and cannot be distributed among several owners. NFTs simultaneously ensure that customers are shielded from the problems of bogus NFTs. Even NFT critics have openly stated that people could just take pictures of NFTs and sell them or even offer them for free. But you must ask if you own the asset.

FOR INSTANCE, downloading *a picture* OF *THE LAST SUPPER* from the internet DOES NOT MAKE YOU its owner, IN THE SAME WAY, ARE NFTS.

The standard rules of control and management of ownership of assets can be converted and ownership can easily be transferred.

AUTHENTICITY

The benefits of NFTs rely mostly on the uniqueness of the tokens. They are created on the blockchain network, thereby implying the association of unique records with them. This uniqueness of NFTs showcases their power for contributing value. At the same time, creators have the chance of issuing only a specific number of NFTs to introduce scarcity of supply or they can choose to create multiple replicas like in the case of tickets. On the other side, the immutability of the blockchain on which NFTs are stored also assures authenticity and even they are immune to modifications, removal, or replacement. Therefore, NFTs can easily showcase their authenticity as the most valuable quality.

TRANSFERABILITY

It is easy to trade NFTs freely especially in markets with a wide range of options of trading. For example, NFTs can help overcome the 'Walled Gardens' problem when playing games. Many games issues, especially in-game items that players purchase to improve their gaming experience. But in-game items are restricted only to the environment of the games, and players can not use them anywhere else. Furthermore, players can also lose their investment in the in-game collectibles or items when the games go out of trend.

BUT WITH *the help* OF NFTS, *GAME CREATORS* CAN ISSUE in-game items AS NFTS, WHICH CAN help players TO *keep a hold* on THEIR *DIGITAL WALLETS*.

Later, players could use the in-game items outside the games or even sell them for a profit.

ECONOMIC OPPORTUNITY

NFTs have found wide-ranging applications in the domain of digital content in present times. The basic reason for the feasibility of NFTs in the digital content

world refers to the fragmented nature of the industry. Content creators frequently encounter the concerns of other platforms gulping down their profits and potential for earning. For example, a digital artist publishing their content on the social network would also earn money for the platform selling ads to the fans of the artist. While the artist gets great exposure and does not help the artist earn any form of money for benefits to the platform. The benefits of NFTs can also lead to the development and growth of a completely new creator economy. The creator economy will focus to help content creators avoid the need to transfer ownership to the platform they use to advertise their content.

But it also has its fair share of disadvantages:
The NFTs are interesting, there is no doubt about them. But there are some major obstacles to investing in it. Some of the most important issues include:

BODY ART CANNOT BE COMPUTERIZED

The reasons for having physical art and the reasons for having digital art are often different. You can't do digital body art. There is an attraction to see a one-size-fits-all drawing with your own eyes. These tokens just can't be given to you.

UNCERTAIN VALUE

Even for professionals, NFTs confuse assets. If you buy one of these oaths, you are not purchasing the copyright. People can still find online copies of the art that owns their token, and there is nothing stopping them from copying and pasting these files on social media, showing off, and sharing what you may have cost millions of dollars. In fact, when you purchase these goods, everything you own is a record stating that you own the token on the back of the real property. The real question here is, "How important is it to have an asset that you can actually control?". Depending on how collectors respond to this question in the future, those who invest in all of these tokens may be left with an inexpensive digital record.

ENVIRONMENTAL COST

NFTs share one harmful trait with their cryptocurrency cousins: they both use a ton of energy. Nature is a hot topic of debate as it has passed. Any record embedded in the Ethereum blockchain takes up an important computer, requiring high power consumption. "Bitcoin is a proof-of-work blockchain, meaning it uses a proof-of-work (PoW) consensus mechanisms to secure the blockchain and verify transactions. PoW means that miners compete against each other to mine a block," says Susanne Köhler, a sustainable blockchain technology researcher at Aalborg University in Denmark.

TO PUT THIS INTO PERSPECTIVE, the daily carbon footprint OF BITCOIN IS THE equivalent OF WATCHING 57,000 HOURS OF YOUTUBE VIDEOS AND THE environmental impact OF NFTS IS similar.

Therefore, trade in NFTs and other blockchain-based assets is not an environmentally friendly process. In fact, a recent study by Cambridge University suggests that almost everything related to a blockchain is not highly sustainable from an environmental point of view due to the amount of energy used.highly sustainable from an environmental point of view due to the amount of energy used.

Beeple is a US based graphic designer and digital artist and his work "Everydays – The First 5000 Days" NFT, 21,069 pixels x 21,069 pixels (316,939,910 bytes) still remains the most expensive NFT sold on the platform.

BATTERY MANAGEMENT *SYSTEM (BMS)*

Mayur Chavan (TE ELEX)

The BMS is an electronic circuitry to protect the cells from operating in unsafe conditions like over current, over/under voltage, and over/under temperature. In addition, the BMS can also be used to report status (i.e., battery life) during charging and discharging using outputs from sensors to the user while keeping track of any anomalies with the battery.

Every battery cell and chemistry have voltage, temperature, and current range within which it can safely operate. When a cell drops under or surpasses these ranges, it can be detected and controlled by the BMS. For example, lithium is a highly reactive substance; hence the BMS should monitor each lithium cell to ensure that it remains operating within predefined limits. This keeps the battery safe and preserves it in the long haul. Individual cells inside a battery pack don't work equally. One cell might be weaker or stronger than the other, charging or discharging quicker than others inside the chain. Without proper compensation, this could corrupt the health of the overall pack. If one cell short circuits or fails, this influences the stability of the whole pack. Cell balancing equalizes the charge between individual cells based on each cell's capability.

A BMS HELPS TO *monitor and control* THE *CHARGE REQUESTED FROM EACH CELL* IN THE CHAIN, ensuring that *SOC (STATE OF CHARGE)* REMAINS equally distributed.

As previously stated, the fundamental role of the BMS is to guarantee that the battery functions within the safety boundaries. Because a battery pack is made up of cells with a voltage rating of 3V, the BMS must guarantee that the cells in the pack are not depleted past the 3V threshold.
Another area that requires BMS monitoring is charging control. The charging is done in two steps. The first step is Continuous Current (CC), in which the charger provides constant current to charge the battery. The second stage, known as the Constant Voltage (CV), is when a constant voltage is given to the battery at a very low current. The BMS ensures that these functions run as smoothly as possible.

All cars have a fuel gauge, and EVs have a battery state of charge (SOC) gauge as well. The BMS assists in signalling and displaying to the driver the current status of charge in the battery. The voltage and current measurements are done using several methods that compute the battery pack's state of charge (SOC). Coulomb Counting is one of the methods utilised, and it measures the discharge of the battery and integrates the discharging current over time to determine SOC.
Aside from the present status, BMS is also in charge of monitoring the state of health (SOH). The battery's capacity may decrease with time.The BMS assists in identifying the battery's condition of health by calculating the age and predicted life cycle depending on consumption. This will aid in calculating the mileage on each charge.

BMS can communicate in bi-directional type in two different modes of communication like Internal & External Communication, both modes operating simultaneously. The internal communication utilized a central control unit to connect with internal hardware and its components at a cell level of the cell. This communication are often done by using

- Sensor
- Relay
- Switching components
- Solid state components

External communications is completed between BMS and other high level hardware such as computers or HMI. This communication can be possible by wirelessly or wired connected devices. Its simple and easy to use for command and control. External communication are often achieved by various methods like:

- DC bus serial communications.
- Serial communications.
- Various wireless communications.
- CAN bus communications.

These communications methods are used for various operations in the system.

The BMS is connected in different ways known as topologies. BMS topologies fall in 3 categories:

- Centralized: a single regulator is connected to the battery cells through a large number of wires.
- Distributed: a BMS board is installed at each cell, with simply a single communication link between the battery and a regulator.
- Modular: a few of regulators, each handling a specific number of cells, with communication between the regulators.

Obviously, the battery cells will degrade with time. A smart EV BMS influences this degradation, which results in a change in battery properties such as current, voltage, and so on.

For example, if a battery cell overheats and becomes damaged, it will begin charging at a lower voltage than the rest of the cells. The BMS detects the issue and then adjusts the charging process such that all cells begin charging at a reduced voltage. This lessens the burden on the battery pack as a whole and extends its life.

Centralized BMSs are most affordable, least expandable, and are hampered by a multitude of wires. Distributed BMSs are the most expensive, least complex to install, and offer the cleanest assembly. Modular BMSs offer a compromise of the features and problems of the other two topologies.

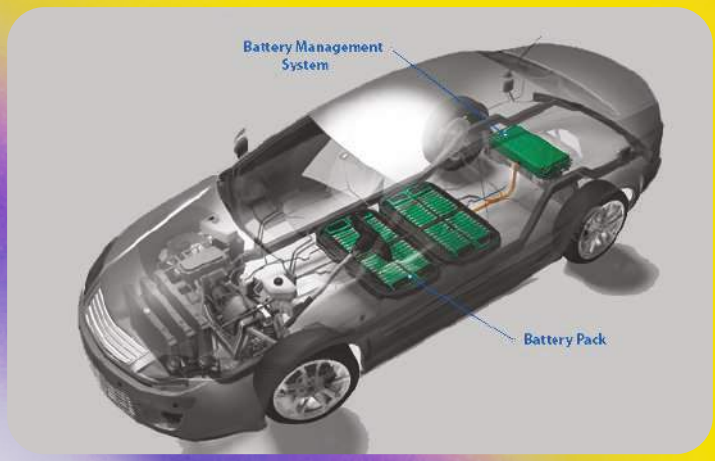
EV BMS are becoming more prevalent.

THE most recent ADVANCEMENT IS A *WIRELESS BATTERY MANAGEMENT* SYSTEM, WHICH frees us from *CAN, SPI, AND BUS WIRES*.

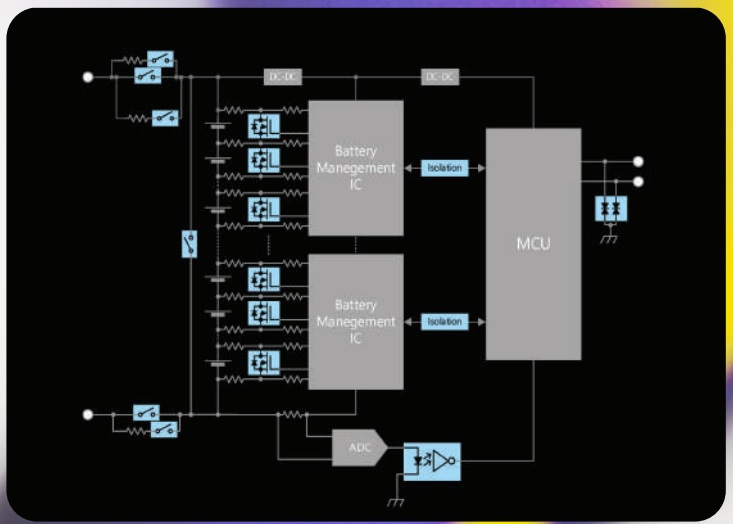
As the battery packs grow in size, such wires add to the complexity, which ultimately raises the risks associated with numerous wires and clogs the BMS.

Many outstanding innovations relating to the Electric Vehicle Battery Management System and its accompanying components are being introduced nowadays. Such innovations will energise the forward-thinking EV initiative that governments, OEMs, and other stakeholders are putting their whole weight behind.

GM's New EVs Will Use A Cloud Based Battery Management System



Structure of a BMS



Toshiba's BMS Chart

INTRODUCTION
To DevOps

Sandesh Gavali (SE ELEX)

Andrew Clay and Patrick Debois had a conversation in 2008 that sparked the idea for DevOps. They were concerned about Agile's shortcomings and desired to devise a better solution. The concept gradually gained traction, and with the DevOpsDays event in Belgium in 2009, it became somewhat of a catchphrase.

WHAT IS DEVOPS?

DevOps is a set of cultural ideas, practises, and tools that improves an organization's capacity to provide applications and services at high velocity: changing and enhancing products at a faster rate than traditional software development and infrastructure management methods.

DevOps affects all stages of the development and operations lifecycle. DevOps pulls together the skills, methods, and tools from every aspect of an engineering and IT organisation, from planning and building to monitoring and iterating.

WHY IS DEVOPS IMPORTANT?

REDUCED TIME TO MARKET

One of the primary reasons why DevOps is vital for your business is that it allows you to provide software more quickly due to optimised processes, proper automation, methodical release planning, and other factors. A shorter time to market means you have a better chance of outrunning your competitors.

FASTER INNOVATION

Because of faster product delivery to market, you can innovate faster than your competition. The DevOps culture also allows the team to openly contribute groundbreaking ideas and discuss their perspectives in real-time communication.

INCREASED EFFICIENCY IN DEVELOPMENT

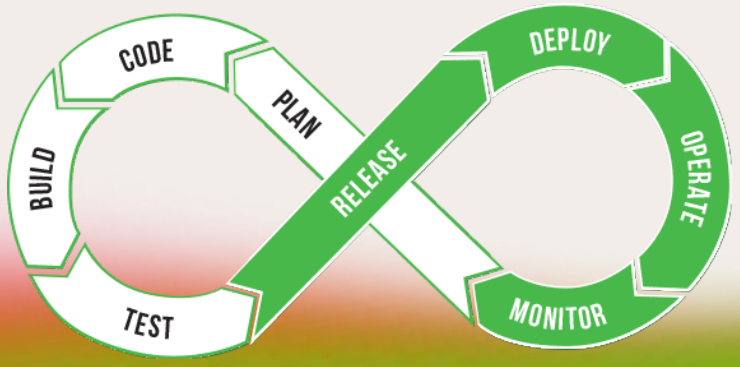
In DevOps, software engineers do not need to spend time on tasks that are completely automated. The quantity of manual labour is kept to a bare minimum. Parallel workflows, acceleration tools, scalable infrastructure, continuous integration servers, and other features all help to ensure efficient development.

HIGHER RELIABILITY

Processes including development, deployment, and others become more predictable and error-free. DevOps and continuous testing provide shorter development cycles, allowing the team to detect any inconsistencies in the product in a timely manner. It is simple to fix difficulties and also incredibly easy to roll back a deployment at any time.

CUSTOMER SATISFACTION

Another significant argument for the importance of DevOps is that the customer-centric approach, regular feedback, faster market delivery, and ongoing improvement all lead to the most fulfilling results in software development.



Enterprises seeking to scale AI development capacity from dozens to hundreds or even thousands of machine learning models can benefit from the same engineering and operational discipline that DevOps brought to software development.

GREEN BUILDING & *Infrastructure*

Sachin Tiwari (TE ELEX)

There's a need to boost India's Green Building Infrastructure:
This can be achieved through a regulatory framework that promotes global climate change mitigation and green buildings across the country and by strong implementation of the prevailing
policies. If we've learned anything over the last 10 years of green building innovation and therefore the construction of smart cities and communities, it's that what gets measured gets done. What gets done gets improved. And what gets improved, gets replicated. By tracking and measuring building and community performance, cities, states, and nations can make improvements, raise the quality of living for all and become true catalysts to reversing the greatest existential threat of our times: climate change. As the country with the second highest population, India has a powerful role to play in demonstrating leadership across the globe. The good news? Such leadership has been happening for over a decade. The government has committed to reducing emissions by 33-35 per cent, increasing non-fossil-based power capacity and reducing carbon by almost three billion tons by 2030.

STEPS TAKEN BY THE GOVERNMENT TOWARDS GREEN INFRASTRUCTURE:

India has been on the forefront of change, including the 2006 National Environmental Policy, which targeted several challenging issues including pollution, waste management and energy, and the 2008 National Action Plan on Climate Change, which focused on the critical balance between economic development and climate change. The government has also made housing for all a national priority with the introduction of the Pradhan Mantri Awas Yojana (PMAY) in 2015, which set in situ a goal of providing affordable housing to the urban poor by 2022. Less than two years later, PMAY's goal was expanded to incorporate those living in rural areas also. We all know robust economic development is important for India. We also know that smartly assessing and controlling its impact on our surroundings is equally important for securing our planet for future generations.

EMBRACING SUSTAINABILITY:

The rising number of environmental catastrophes has led several countries to implement resilient green buildings across all construction sectors. For instance, the ecu Union has planned an environmentally friendly economic recovery from the repercussions of the Covid-19 pandemic. Its plan is to focus on building renovation, renewable energy and clean hydrogen fuel with attention on low-carbon investments.

INDIA IS CURRENTLY *THE FOURTH LARGEST MARKET* WITHIN THE WORLD FOR green buildings, TOUCHING every building sector.

This in-country leadership in green buildings and green construction has contributed greatly to economic process and development, while simultaneously making smart investments for the longer term.

THE WAY FORWARD

A meaningful regulatory framework to advance global climate change mitigation and green buildings across India are often successfully achieved with a robust implementation of current national policies and their replication and enforcement at the State level, and therefore the undertaking of holistic, additional measures which will quicken the pace of green building. These additional measures include improving resilience, supporting public transportation, supporting green spaces, supporting public health and wellness, promoting equity, and more. National policies and their replication and enforcement at the State level, and therefore the undertaking of holistic, additional measures which will quicken the pace of green building.

5G WIRELESS Technology

Kaushal Vishwakarma (TE ELEX)

The fifth generation of wireless communications technology that supports cellular data networks is known as 5G. Large-scale deployment began in 2019, and nearly every telecommunications service provider in the developed world is now upgrading its infrastructure to support 5G technology. 5G communication necessitates the usage of communications devices (mainly mobile phones) that are compatible with the technology.

The 5G frequency spectrum is separated into millimetre waves, mid-band, and low-band frequencies. Low band operates on the same frequency spectrum as its predecessor, 4G. The fastest is 5G millimetre wave, with actual rates of 1–2 Gbit/s down. Frequencies are above 24 GHz, rising up to 72 GHz, which is above the lower threshold of the extremely high frequency band. Because the reach is limited, additional cells are necessary. Because millimetre waves have trouble passing through many walls and windows, indoor coverage is limited.
Initially, the phrase was related with the International Telecommunication Union's IMT-2020 standard, which demanded a theoretical peak download speed of 20 gigabits per second and a theoretical upload speed of 10 gigabits per second, among other things. The industry standards organization 3GPP then chose the 5G NR (New Radio) standard, along with LTE, as its proposal for submission to the IMT-2020 standard.

THE *5G NR (NEW RADIO) AIR INTERFACE* IS a new air interface CREATED FOR THE 5G NETWORK. IT is intended to be THE GLOBAL STANDARD FOR *3GPP 5G NETWORK* AIR INTERFACES.

5G NR can feature lower frequencies (FR1) less than 6 GHz and higher frequencies (FR2) greater than 24 GHz. However, speed and latency in early FR1 deployments employing 5G NR software on 4G hardware (non-standalone) are only marginally better than new 4G systems, estimated to be 15 to 50% better. The first all-5G smartphone, the Samsung Galaxy S20, was introduced on March 6, 2020. According to Business Insider, the 5G feature is more expensive than the 46; the line starts at US $1000, compared to the Samsung Galaxy S10e, which starts at US $750. On March 19, HMD Global, the current maker of Nokia-branded phones, launched the Nokia 8.3, which it claimed has the most 5G readiness of any phone produced up to that point. The mid-range device, which will cost €599 in the Eurozone at launch, is said to support all 5G bands from 600 MHz to 3.8 GHz.

APPLICATION

The applications of 5G network service are as follows:
First and foremost, in comparison to 4G service, 5G may supply up to 1.2 to 1.5 gigabytes per second via a direct line of contact.
In a military context, where the utilization of hyper humanoid buildings or unmanned aerial, Teresita, and aquatic vehicles can save a soldier's life.
It can be employed in a self-driving transportation system.
The medical industry can employ 5G network service for remotely controlled robot for surgeries, where the controlled bot can be put at a single location and doctors can operate on patients remotely across the continent.

ADVANTAGES

The major benefits of 5G are faster transmission speeds, reduced latency and hence more capacity for distant execution, a bigger number of connected devices, and the ability to construct virtual networks (network slicing), allowing for more tailored connectivity to specific demands.
Lower latency - Latency is the amount of time that elapses between when we give an order on our device and when the action takes place. The latency of 5G will

be ten times lower than in 4G, allowing remote actions to be performed in real time.
Greater number of connected devices - With 5G, the number of devices that can be linked to the network increases dramatically, reaching millionaire levels per square km.
Network slicing - 5G also allows for the implementation of virtual networks (network slicing), as well as the creation of subnets, in order to provide connection that is more tailored to individual needs.

DISADVANTAGES

Though 5G technology has been researched and conceptualised to solve all radio signal problems and hardships of the mobile world, it has the following shortcomings due to some security reasons and a lack of technological advancement in most geographic regions:

DUE TO *THE MICRO BANDWIDTH* AT WHICH 5G OPERATES, IT CANNOT *PENETRATE* walls and buildings, AND EVEN TREES AND RAIN ARE SEEN TO *absorb the signals*.

Technology is still in development, and study into its viability is ongoing. The claimed speed of this technology appears difficult to attain (in the future, it may be) due to incompetent technological support in most regions of the world. Many of the old devices would not be compatible with 5G, hence, all of them need to be replaced with new one — an expensive deal. Because of its low penetrating capabilities, the infrastructure for a 5G network will require far more resources than a 4G network. As a result, developing infrastructure is expensive.

Overall, 5G is the best technological achievement for communication reasons. It can give the power of instant file downloads, however due to its early phases, uploading is not the major suit of the 5G network. 5G networks bring a lot of versatility to all other industries to expand the thought process of things such as autonomous vehicles that do not require human interaction to travel from one place to another, soldiers in battle fields do not have to die patrolling or stepping on IEDs instead, humanoid robots can fulfil the desire of war fields without any casualties. Yes, it has more disadvantages than advantages. When we first discovered touch sensitive mobile phones, everyone thought the process was different; some said it was revolutionary, while others said where the buttons are, which are the most important part of a phone. However, today, everyone is using this buttonless device that is compatible with various other devices in one and competing with computers by having wireless technology that can download or even upload in just a few seconds.

5G applications were on display at the Smart China Expo in August.

A small 5G base station of Rakuten Group Inc. of Tokyo, which is building Japan's fourth nationwide wireless network.

AN OVERVIEW OF *Nanotechnology*

Hritik Pal, Teerthraj Verma & Dipesh Jain (TE ELEX)

Nanotechnology is the process of producing items linked to technology and science on a very small scale. It involves the manipulation of matter at the atomic, molecular, and supramolecular levels. The National Nanotechnology Initiative later adopted a broader definition of nanotechnology, defining it as the manipulation of matter with at least one dimension scaled from 1 to 100 nanometers.

NANOCOMPUTING

A nanocomputer is a computer that is smaller than a microcomputer, which is smaller than a minicomputer. The term "nanocomputer" is increasingly being used to refer to general-purpose computing systems the size of a credit card. This category includes modern single-board computers such as the Raspberry Pi and Gumstix. Smartphones and tablets could be considered nanocomputers as well. Nanocomputers can be constructed in a variety of ways, including mechanical, electrical, biological, and quantum nanotechnology. There used to be widespread agreement among hardware developers that semiconductor transistors would not be employed in nanocomputers because they perform much worse when shrunk to sizes less than 100 nanometers.

TECHNIQUES IN NANOTECHNOLOGY

NANOFABRICATION

The design and construction of devices with dimensions measured in nanometers is known as nanofabrication. Computer experts are interested in nanofabrication because it enables super-high-density microprocessors and memory devices.

QUANTUM DOTS (QDS)

Quantum dots (QDs) are tiny crystals created by humans that can transport electrons. When UV light strikes these semiconducting nanoparticles, they can emit a variety of colours. These man-made semiconductor nanoparticles have found use in composites, solar cells, and fluorescent biological markers.

CARBON NANOTUBES

Carbon nanotubes are carbon tubes with diameters measured in nanometres. Carbon nanotubes are single-wall carbon nanotubes with sizes in the nanometre range.

DNA COMPUTING

DNA computing is a subset of computing that employs DNA, biochemistry, and molecular biology hardware rather than typical silicon-based computer technologies. This area of research and development is concerned with the theory, tests, and applications of DNA computing.

APPLICATIONS

- Space
- Electronics
- Medicine
- Fabrics
- Better water quality
- Solar cell and batteries

ADVANTAGES	DISADVANTAGES
• Create unique material • Light weight • Low cost • Less pollution	• Can cause damage to humans • Can lead to conflicts and war

TYPES OF NANOCOMPUTERS

- Electronic nanocomputing
- Mechanical nano computers
- Chemical and biological nanocomputing
- Quantum nanocomputing

APPLICATION OF NANOCOMPUTING

- DNA computing
- Quantum computing

FOR DNA COMPUTING

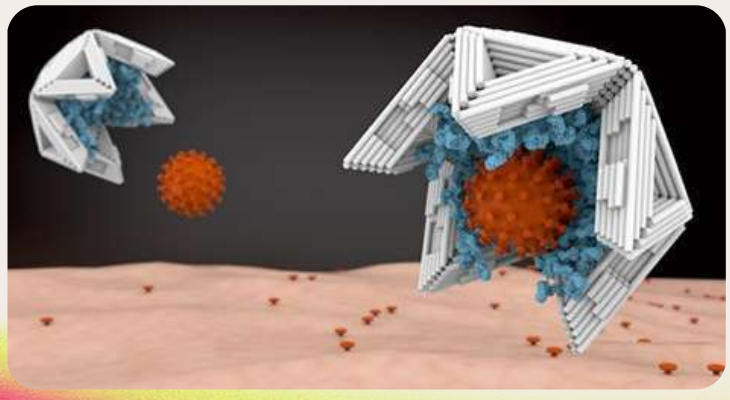
ADVANTAGES	DISADVANTAGES
• No electricity requirement • No maintenance • Can store lot of information	• Recovery time more and high cost

FOR QUANTUM COMPUTING

ADVANTAGES	DISADVANTAGES
• Good performance • High speed	• Work at absolute zero temperature • Magnetic field required

Nanotechnology is becoming increasingly important as the world's technologies and machinery advance. It has greatly aided in the reduction of human efforts. It has also made it easier to design machines with high efficiency, accuracy, and short development times. Nanotechnology is important in almost every field. It also makes significant contributions to artificial intelligence. It has also made it possible to store a large amount of data in a little amount of space (nanomaterial). Human life would have been much more difficult if nanotechnology had not existed. Nanotechnology, for example, is utilized to treat cancer. It also makes a significant contribution to the overall economy of the country.

Tool-X consists of nanoparticles suspended in an oil-based formulation for machines and applications that require it, such as Swiss-type lathes and gear-making operations to redefine metalworking fluid.



Elena-Marie Villner's impression, a DNA shell traps a virus to stop it from interacting with host cells.

Elena-Marie Villner's impression, a DNA shell traps a virus to stop it from interacting with host cells.

THE FUTURE OF *Space Exploration*

Shashank Rai (SE ELEX)

So you've been hooked on sci-fi like Interstellar and modern-day explorers like Elon Musk, and now you're obsessed with the idea of colonising and exploring space, so you do some research on how we can colonise space, and boom, it's too damn expensive. For example, if you're going to take any long-duration flight to say, Mars, you're going to need a lot of water. A standard bottle weighs about a pound, and at Space X's rates, launching one water bottle from Earth will cost $2500. As long as it takes that much money to launch water, building structures and raw materials into space, space exploration and space colonies are going to move at a pathetically slow rate. That's why some aspiring pioneers think that all you need to solve this problem is to look up and refer to all the asteroids in our solar system. These asteroids contain a practically unlimited number of natural resources that we could harvest into space instead of having to launch them up into space. This is called space mining.

Asteroids, as we know are clumps of leftover rock and dust from when the planets were forming in our solar system. Although mining asteroids may sound a little farfetched, it has already happened back in 2005. Japan's Hayabusa spacecraft landed on the surface of an asteroid.

AFTER A 2-year flight, *THE HAYABUSA* DOCKED WITH THE FLOATING ROCK FOR 2 MORE YEARS, COLLECTED a tiny sample of an asteroid WITH A TONNE OF DATA, AND STARTED its return to Earth in 2010.

This mission is what really sparked this new space race for extraterrestrial mining. So no longer was this science fiction. So now that we know that the technology to harvest space rocks already exists, all we had to do was to increase the scale.

One type of asteroids produces useful metals such as gold, platinum, and others such as palladium, iridium, and more. These metals happen to be the same ones we use in our smartphones and other electronic metals that cause a lot of pollution and destruction when mined on Earth. These asteroids are thought to have formed during the formation of planets such as ours. All of that pressure heats up the planet's matter and turns it into a liquid during its formation. The heavier elements, such as metals, gravitate towards the core in the same way that oil and water separate in a glass of water, which is why it's difficult to find things like gold and platinum near the planet's surface; they're mostly found deep within the earth, and the fact that we need these metals in our daily lives makes them even very valuable. According to a theory, these types of asteroids formed as a result of planets colliding during their formation, causing those inner metal cores to be thrust out into space. Take, for example, the asteroid 16 psyches. 16 Psyches has a 140-mile diameter and is composed of 95 percent metals such as iron, nickel, and possibly even golden platinum, which Bloomberg estimates to be worth a theoretical 700 quintillion dollars at today's metal prices.

Although golden asteroids sound appealing, the problem with mining asteroids for metals is that even if you extracted a large amount of metals, by the time you returned to our planet, you would have spent more money than it would have cost to mine the materials on Earth.

C-types include something we have in plenty here, but they're worth their weight in gold in space. As previously discussed, if we are to explore and inhabit space, we will require a large amount of water, which is obscenely expensive to launch from the ground. Water is not only essential for our health and existence; once collected from C-type asteroids, it also makes excellent fuel. Because hydrogen and oxygen can be broken down into hydrogen fuel, the first entrepreneurs who can mine water from asteroids will be able to sell

anything in space right away, as every space traveller will require fuel.We can extend our capacity by establishing space gas stations in low earth orbit and extending them further and further out into the cosmos, just as electric cars require a plethora of chargers around the country for long-distance driving. Fuel accounts for 90% of the bulk of today's rockets, therefore if someone can develop a means to allow rocket businesses and government organisations to carry less fuel, space flight will become significantly cheaper. People will flock to you with cash in hand once this fuelling infrastructure is up and running. Building up colonies, mining metal-based asteroids, and even setting up space hotels makes a lot more economic sense. To keep things simple, the first asteroids we'd handle would be near-Earth asteroids. That's all well and good in principle, but how are we going to harvest these raw elements from asteroids?
Mining asteroids is a little more complicated than simply latching onto it and sticking a drill in it because the asteroids are so small that they're held together by just a tiny amount of gravity. If you land it too hard, grill it too hard, or pull out too hard, the asteroids will simply break apart at the seems. This implies engineers will have to think outside the box in terms of how they plan to mine.

TRANS-ASTRA IS ONE FIRM THAT IS paving the road FOR *HARVESTING WATER FROM ASTEROIDS*; THEY PROPOSE to direct sunlight into a concentrated region ON THE ASTEROID WITH LARGE MIRRORS.

Because of the asteroid's low gravity, this concentrated force is sufficient to breach the surface. This converts water and other compounds into vapor, which is collected and stored as ice. They've already demonstrated this on artificial asteroids and vacuum chambers on Earth. They're working on a prototype right now, and if all goes well, they'll be capitalizing on a Space X Falcon 9 soon to test out a small version of the spacecraft. Once they have proof of concept, they intend to build a full-size craft capable of mining asteroids up to 30 meters in diameter and using some of the water it collects as fuel to navigate to other asteroids, with the ultimate goal of having a swarm of them mimicking the behavior of bees.
When Japan's Hayabusa spacecraft returned in 2010, it ignited a new space race for extraterrestrial mining, and a new business titled 'Planetary Resources' swiftly emerged with its own all-star Silicon Valley team that drew investors like Google's Eric Schmidt and filmmaker James Cameron. Not long later, Planetary

Japan's Hayabusa Spacecraft

Resources was joined by a rival known as 'Deep Space Industries.' These two became the faces of the space mining operation, and for a time, what had seemed like a sci-fi pipe dream appeared to be a reality. But you can only go so long without making a profit, and Planetary Resources went bankrupt in 2018, with Deep Space Industries collapsing the year following. According to one former team member, the space mining sector was, for all intents and purposes, dead, but all hope is not lost. On October 20, 2020, NASA's Osiris-Rex spacecraft will land on the asteroid Bennu. It has already successfully gathered a sample of it to return to Earth, and this asteroid seems to be quite threatening to us, with a 1/2700 probability of colliding with Earth between the years 2175 and 2199. Japan's second Hayabusa 2 spacecraft collected another sample from a different asteroid, bringing us to the reality of space mining: do we focus on making space flight cheaper first, or do we try to build a moon or mars base first, or do we accept the high cost of mining asteroids to make space flight cheaper?

John D. Rockefeller is the richest person in history, so wealthy that even when Jeff Bezos' net worth surpassed $200 billion in August 2020, it was still less than half of what Rockefeller was worth (i.e 418 billion dollars). How did Rockefeller accumulate enormous fortune by controlling a new and undeveloped resource like oil?
Oil may no longer be the greatest new thing, but space mining isn't. The modern-day Rockefeller will certainly be the person who figures out how to profit off of this.

MAJOR MYTHS ABOUT *Public Speaking*

Sakshi Porwal (SE ELEX)

There are always two sides to a coin. You may have heard falsehoods as well as facts regarding everything you know. So, how did you come to believe in them?
Things alter and exist in accordance with our vision and ideals.

Similarly, you may have heard numerous truths and falsehoods regarding public speaking. But not everything that appears to be true is. There could be something going on behind the scenes. If you want to perfect it, simply immerse yourself in it as much as possible. Today, there are myths regarding public speaking that are simply myths. Read them, comprehend them, and then eliminate them from your preparation portfolio to measure how quickly you develop your skills.

YOU NEED TO HAVE A GOOD COMMAND OVER ENGLISH

English, the language of the aristocracy? The fallacy is that excellent speaking or communicating is only dependent on fluency in English.

IT'S A LIE.
The power of the words, not the language, determines the success of a speech. Don't forget that language is merely a vehicle for those words and emotions to be expressed. Your words and intentions are what make an impression on your audience. Whatever language you use to convey yourself, it should be clear and understandable to your audience, and the rest will fall into place on their own. However, strive to always use the language in which you are proficient and fluent, rather than English.

YOU NEED TO BE AN EXTROVERT:

What do you think of yourself? Do you consider yourself an extrovert or an introvert? Do you enjoy being social or preferring to be alone? Whatever your answer is, whether you are an introvert or an extrovert, you are just as capable of excelling in public speaking as anyone else.
So don't believe a charlatan who tells you that you can't pursue public speaking or effective communication because you're an introvert. Hence,

IT'S A LIE.
The most important reality is that public speaking has nothing to do with whether you are an introvert or an extrovert. Even if you dislike socializing, you can speak in public, express your ideas and vision, and communicate effectively with anyone, at any time and in any place. You've probably seen many extroverts whose words get stuck in their throats when they stand in front of only a few people to speak, as well as many introverts who can speak their hearts out in front of any number of people, even though they normally say less.
The only difference between speaking openly and not speaking publicly is their belief in their words and their power.

YOU NEED TO START YOUNG

Planning is vital, yet most plans do not come to fruition. It's fine if you haven't started speaking since the day you were born. It's also fine if you didn't start speaking until yesterday. By the way, how old were you when you realised "Age is just a number?"
You have TODAY to begin, and if you still believe you would have begun sooner to succeed in speaking, think again.

IT'S A LIE.
You are not late, but you will be if you do not begin working on it today. Speaking is not as tough as it appears; all you need is practice, preparation, and experience, and everything will fall into place on its own.

STANDING OUT

from the crowd

Sakshi Porwal (SE ELEX)

If you feel that you're in a never-ending race in your life, you're not delusory. Every day, you race for something in your life, whether it's success, money, a relationship, a higher income, or anything else. To win in this magnificent race called life, you must run it and give it your all, but you must also face rivalry and stand out in your own way, as Frank Sinatra would say, "I did it my way." It is also important to understand that there are common attributes that will serve you well and aid you in your endeavours in life.

Don't be scared; they can be completed and learned; no one is born with knowledge; people are "Tabula rasa" or a blank slate when they are born, a slate that must be filled with experience and information as you travel through life.

KEEP A MENTAL NOTE OF YOUR IDEAS

When it comes to organising your thoughts, a realistic and step-by-step strategy is unbeatable. The act of converting a collection of thoughts in your head into a few notes scribbled on some paper can sometimes make things as obvious as black and white. The approaches that follow are excellent for times when you need to take stock of your thoughts.
Simply write down your thoughts on sticky notes, index cards, or a piece of paper, and you'll be able to study, evaluate, and manipulate them as needed.

RECOGNIZE THAT BEING DIFFERENT ALSO IMPLIES BEING ALONE:

Your loneliness does not have to last indefinitely. You can try seeing things in a new light or associating them with pleasant emotions. Taking care of yourself with patience and compassion may help you deepen your bond with yourself, easing feelings of loneliness. Writing down happy memories in a notebook might help you live a happier life.

AGREE WITH YOURSELF AND IDENTIFY OTHERS WHO AGREE WITH YOU

Feeling truly happy about oneself entails appreciating the person you are on the inside and out. To learn to accept yourself and handle the misery in your life, you must put in the effort and make some significant changes. If you want to feel good about yourself, you must first understand the ideas, feelings, and behaviours that may be impeding your ability to do so. Following that, you can focus on developing a way of life that makes you feel useful, appreciated, and fulfilled.

UNDERSTAND WHY STANDING APART IS ADVANTAGEOUS

You are one-of-a-kind, with unique abilities, experiences, and ideas; don't waste them by being the same as everyone else. Nobody ever achieved greatness or made a difference by adhering to the expectations of others around them. The longer you adhere to the demands of the majority, the more difficult it is to break away when necessary. The majority of people are scared and suspicious, but being brave and fearless is a far more gratifying and wonderful way to live.

ON A *Brighter Note...*

Shantanu Kudav (TE ELEX)

Covid-19 has affected the lives of innumerable people, both physically and mentally, and both positively and negatively. But we will be focusing on the bright side of it because being positive is what life is all about. People all across the world are waiting to go out and meet up with their friends and spend quality time with their loved ones. As far as the economy is concerned, well, that doesn't look so good either. There was a lot of panic spreading among the people regarding the pandemic. People were afraid to get out of their houses or talk to other people. But eventually, something unexpected happened. People got used to it. Living in conditions like, 'working from home' and rarely getting out of the house initially seemed like a far-fetched dream for a lot of people. But people accepted that lifestyle. Although people were extremely dejected by this pandemic and lockdown situation, and rightly so, what a lot of people didn't realize was that the pandemic helped them instill among themselves, a lot of qualities and positive influences that were required for sustainable living. This essay is an attempt to bring forward these underdog qualities that people gain.

The first lesson people learned from this situation was ADAPTABILITY. People didn't sit at home clueless about what to do in this situation. "The Show Must Go On." People realize that just waiting for this situation to change won't do any good. Teachers came up with online classes, corporate offices came up with 'Work From Home', and online shopping went up with a boost. The quality of adaptability is necessary in this unpredictable world. Whether they lived in a 20x20 house or a mansion, the only solution was adaptability. If things don't go according to plan A, try Plan B. If it still doesn't work, try Plan C. But don't stop. This was the unspoken message people had instilled in their minds. Sulking and complaining were no longer an option. Adapt and Conquer was the motto. And it was great to watch people slowly adapt to this situation. Working from home may not be as efficient as the workplaces were, but people didn't stop and that's what mattered.

The second lesson is PASSION. Everyone has an abandoned passion. It wasn't abandoned purposefully. Everyone had their reasons. Some didn't have time to

Artwork by Diana Traykov

devote to that passion, while some didn't have the courage. Some thought following a certain kind of passion was embarrassing, while some didn't even have an idea that they were passionate about a particular activity. Lockdown gave everyone the courage, time, and motivation to pick up where they had left their passion and excel in their domain. So it didn't matter if it was a dusty guitar, a YouTube startup idea, or making Dalgona Coffee, people gave it a shot. And the best part about it was, there wasn't anyone to judge them. There wasn't anyone saying "I don't have time for this".

MANY PEOPLE UNARGUABLY *FOUND THEIR PASSION* OR INTEREST which they didn't even know EXISTED.

Another important lesson people learned was FOCUS.

This again is hands down one of the qualities that everyone must have adopted by now. Because perhaps for the first time, people were not sitting in their cabins or individual cubicles but were surrounded by the background noises from their family and babies crying during conferences. Despite all this, people knew that it was the happiness of that same family that they were working so hard for. So they had to focus. They had to work hard despite interruptions. Interruptions came not only from their ends but also from the colleagues with whom they were working. But they worked. They supported each other in difficult times. They believed that they could run through this together.

The next commonly adapted quality was CREATIVITY. People might argue that passion was already discussed above. Well, creativity can be considered as a subset of passion, but it truly deserves a separate explanation because of the way it has impacted people all over. People have gotten monotonous from their daily 9-5 routine over and over for the last umpteen years of their lives. In times like these, where people were locked in their own houses, people with an already existing passion didn't have to go through a lot. But it was time for people with no idea of their passion to be creative. to try out new trends and see if they catch their interest. And in the end, even if they didn't find a suitable passion for themselves, they were satisfied with having tried different activities rather than indulging in nothingness. People acquired at least a bit of knowledge about some basic activities in this process. And again, this doesn't mean people with already existing passions were satisfied with what they had learned. They, too, tried new and interesting activities and at the same time, through social media like Instagram and Facebook, motivated and nominated others to try out new stuff too.

The next and Most important quality that people can take away from this situation is HEALTH AND SAFETY. HEALTH COMES FIRST. It cannot be emphasized enough how important this quality is.

PEOPLE FINALLY began to realize that SAFETY AND HEALTH was something that *HAD TO BE KEPT ABOVE WORK OR STUDIES*.

May it be physical health or mental health, people become aware of the issues faced by society and the ideal way to deal with health. Maybe once things get back to normal after the lockdown, Health and Safety finally be a factor that people will consider before skipping breakfast to get to work on time.

Another factor people realized during this pandemic is FAMILY. The most underrated word in today's world is Family. All these years, people have taken their families for granted. People used to be engrossed in their mobile phones after coming home from work. This lockdown brought together families in an unimaginable way. Many families that suffered from "Family issues" are now recovering. People were enjoying the 'Quality Time' with their family. People realized that sitting down face to face with your family and having a conversation isn't what quality time is, but just being there for each other, the mere presence of each other did wonders that someone with family issues could only possibly imagine.

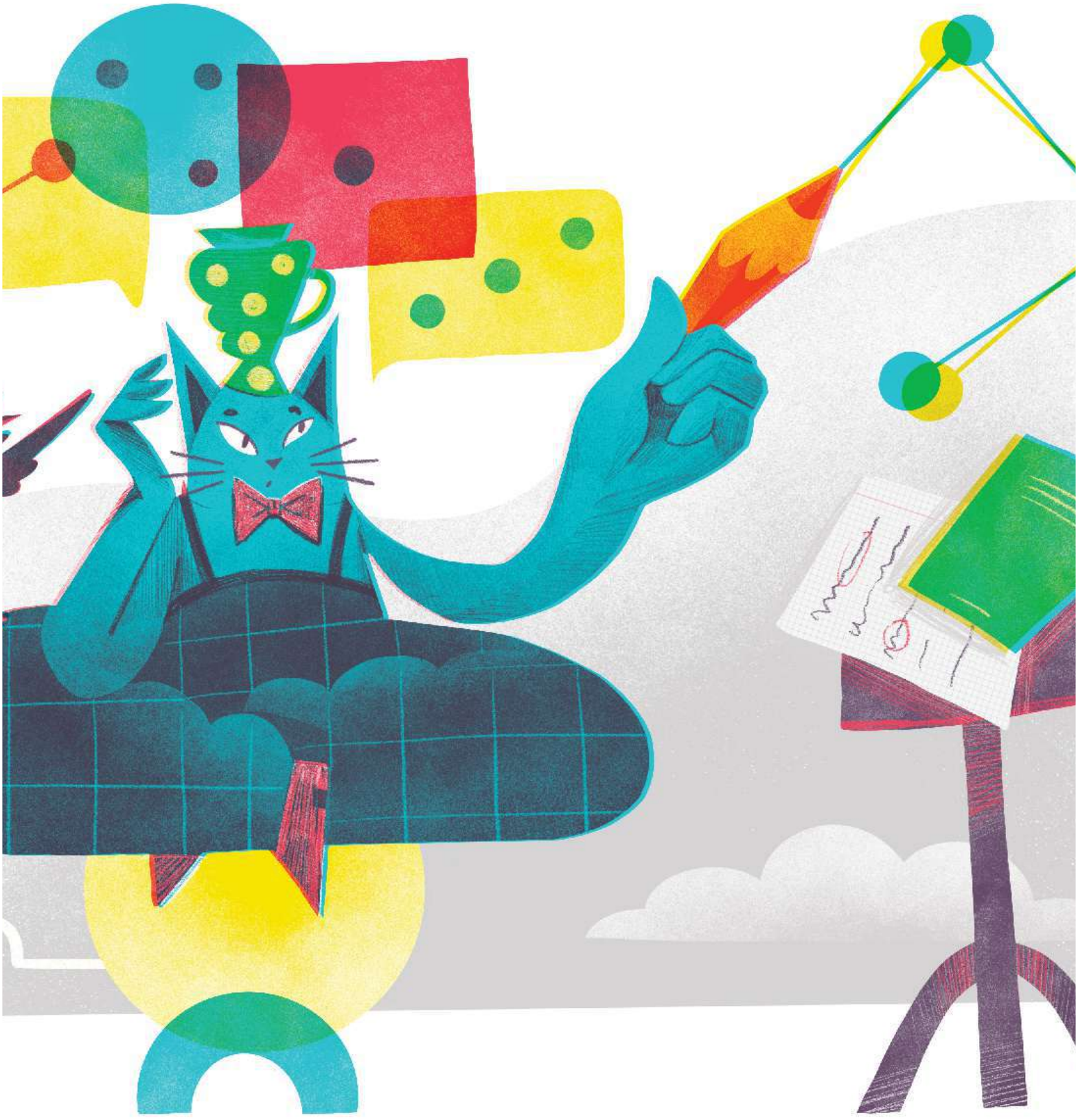
Coming to another important quality that people all over the world experience, UNITY.

PEOPLE CAME TOGETHER. *PEOPLE STOOD FOR EACH OTHER*. PEOPLE supported each other THROUGH ALL THE *ups and downs*.

Artists from all over the world proved to be the most essential source of entertainment. The world had already become a smaller place years ago, but now it had truly become a small place of togetherness. It inculcated a feeling of unity. A world divided by regions, but united by values.

If we need to think of a quality that an individual has adapted for himself alone, it has to be RETROSPECTION. People had the time to relax, sit back and think about all that had happened in the past. Some people may argue that dwelling upon the past won't gain anything and would deteriorate mental health, but if we think about it, it allows us to think about the good things as well as the mistakes that we did and how those mistakes could have been avoided. That is not going to change anything that happened in the past, but it would give us a better perspective for the future. And a better future is what we live for.

Whether people become "ATMA NIRBHAR' or adapt to the qualities mentioned above is dependent upon individual perspective. These qualities have unarguably been instilled in the minds of the people. Now what we can do with these qualities is sustain them. It took a global pandemic for people to gain these qualities, but since they have now, the biggest challenge is to sustain the qualities acquired. Sustain them even after this lockdown is over. And it would be difficult. There are no two ways about it. But thriving to keep those qualities intact and everlasting is what makes us better humans.



Artwork by tubik.arts

RESEARCH PAPER

The worldwide pandemic has increased the rate at which companies are bringing new ideas to market, and prioritizing innovation today is the key to unlocking post-crisis growth. Students from the ELEX department developed and explored their unique ideas throughout the pandemic. You can find summaries of these research papers in this section, and if you want to read the entire paper, you can scan the code attached to the article to read it in its entirety.

MONITORING AND DETECTION OF COVID-19 SYMPTOMS USING WEARABLE SENSORS

SHREYANSH JAIN | ROHIT KAMAT | AKSHAT DOSHI

Humans are utterly reliant on technology nowadays, and they are working hard to enhance it. People's lives have become more complicated and hectic. They don't prioritise their health because of their hectic routine. IoT in healthcare is a crucial actor in offering improved medical facilities to people while also assisting doctors and hospitals. As a result, we created the project "Continuous monitoring and identification of symptoms for Covid-19 using Wearable Sensors." The goal of this project is to autonomously monitor a person's health. This health band can detect a person's body temperature, oxygen levels, and pulse rate. The COVID-19 pandemic has highlighted the importance of harnessing and using our digital infrastructure for remote patient monitoring. We see a need for more robust disease diagnosis and monitoring of individual and group health, which might be supported by wearable sensors, as current viral testing and vaccines are sluggish to appear. While this technology has been utilised to associate physiological measures to daily living and human performance, its use in forecasting the occurrence of COVID-19 remains a necessity. End-users may self-report their symptoms and quality of life or take psychometric tests.

AIM & TECHNIQUE

The Internet of Things refers to the interconnection of devices, apps, sensors, and network connectivity that improves these entities' ability to acquire and exchange data. The differentiating feature of the Internet of Things in the healthcare system is the continuous monitoring of a patient by examining numerous factors and inferring a favourable outcome from the history of such continual monitoring. Many of these devices, which are equipped with medical sensors, can now be found in ICUs.

Despite 24 hours of monitoring, there may be times when the doctor is not alerted in time when there is an emergency. There may also be difficulties in exchanging data and information with specialist doctors and concerned family members and relatives. The technology to improve these characteristics is currently available, but it is neither accessible or inexpensive to the majority of people in poor nations such as India. As a result, these solutions to these challenges may be as easy as an extension to current devices that lack these capabilities.

The data will be displayed on the mobile app after sensing the temperature, oxygen levels, and pulse rate. If the pulse rate drastically increases/decreases over or below the threshold value in a critical condition, a notification will be sent to the emergency contact.

The obtained data can be utilised to assess and predict chronic ailments or other diseases such as heart attacks in the early stages utilising data mining techniques, which will also provide an advantageous approach for decision making.

The major aim of the paper can be summarized as following:

- To obtain the real-time medical information about a patient via IoT.
- Processing and classification of information gathered about the patient.
- To interpret and predict any disease or disorder in preliminary stage itself using the data mining techniques that will also provide the approach advantageous for decision making
- To provide Internet of Things based healthcare solutions at any time and anywhere

RESULT AND FUTURE SCOPE

This project is extremely beneficial to both patients and doctors. The patient can check their health condition at any time from the comfort of their own home, and they only need to go to the hospital if their symptoms worsen.
This may be accomplished by utilising our technology, the results of which are displayed on our app and can be viewed from anywhere in the world. Because it is a prototype model, our system displays near-real-time values of numerous health metrics and simulates how the same can be applied in the actual world.
The log of the patient's body condition can also be used by doctors to investigate and identify the influence of drugs or other such items.

The proposed technology may be installed in hospitals, and a large amount of data can be collected and saved in an online database. Even the results can be made mobile-accessible via an application.
The system can be developed further by incorporating artificial intelligence system components to help doctors and patients. Data mining can be used to search for consistent patterns and systematic relationships in COVID-19 data, which consists of the medical history of many patients' parameters and associated outcomes.
For example, if a patient's health metrics change in the same way as a previous patient in the database, the repercussions might be anticipated. If similar patterns are discovered again, doctors and medical researchers will have an easier time finding a solution to the problem.

The use of face masks with integrated sensors is one of the most promising strategies for identifying infected individuals. During the current pandemic, face masks have become ubiquitous and thus exploiting the platform for continuous health monitoring could be feasible. Low-cost face masks with integrated sensors can offer direct access to many important parameters via exhaled breath, including patterns and rates of respiration, biomarkers of inflammation and the potential detection of airborne pathogens. We see an opportunity to construct a device that can properly monitor many or all indicators of interest and can develop an algorithm to consistently detect changes in population health status using machine learning.

CONCLUSION

In this study, we proposed and demonstrated a prototype for an autonomous system that assures continuous monitoring of various health indices and COVID-19 prediction, sparing the patient the agony of many hospital visits.
The proposed technology may be installed in hospitals, and a large amount of data can be collected and saved in an online database. Even the results can be made mobile-accessible via an application. The primary goal of the project's execution is to detect COVID-19-related concerns and reduce patient mortality. It measures the heart rate, body temperature, and oxygen levels and provides periodic data.
IoT technology provides the door for rapid technological advancement. This evolving technology allows the patient to be monitored at any time without relying on hospitals. It provides continuous data about essential body credentials on a daily basis and aids in the detection of early COVID 19 symptoms utilising sensors and Arduino.

PLASTIC EXTRACT MATERIAL FOR 3D PRINTING

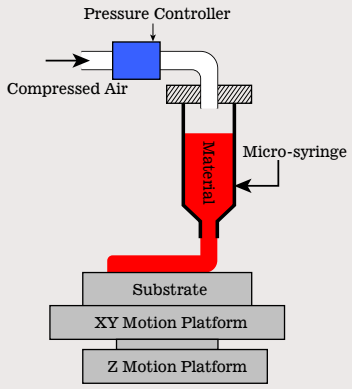
SHANTANU KUDAV	JANANI MENON	SWATI KHANNA	DHARMIK MISTRY
	SARVESH KHETAWAT	ROHIT KAMAT	

Thermoplastics are a desirable material with a vast variety of processes like Injection Molding, Laser Engraving and 3D printing. Production of plastics has escalated annually and is projected to increase to close to one billion tons in the year 2050. The sheer volume of production, in addition to the historical remnants of previous year's production is leading to unprecedented challenges with respect to the management and reuse of this resource. Solutions to this growing problem would require a more robust management process of this resource, which takes a holistic view, enabling recycling from the product design phase right through to waste processing to prevent plastics unnecessarily being destined for landfill or littering our environment. Additive Manufacturing has proved to be a highly disruptive process, even though the application of Additive manufacturing is skyrocketing.

Of all the available technologies, the widely utilized and accessible method is FFF (Fused Filament Fabrication) and it utilizes PLA and ABS plastics. It is found that most of the ABS plastic found in such materials is thrown away as waste. It can therefore be reused and recycled to be used as a feedstock material for 3D printing.

DESCRIPTION

An experiment was conducted to compare the ABS waste plastic with virgin plastic to compare its quality and durability. It was found that the degradation of mechanical properties was reduced only by a percentage as low as 13%. This implies that there is considerable potential for ABS plastic to be reused in functional applications where mechanical integrity is required. The biggest advantage here was that it enhanced material reuse with extremely low carbon footprints. It entails recycling waste plastics found in consumer waste into 3D printer filaments, while renewable energy is used to power the apparatus. To test the efficiency of the prototype system, in this study it was demonstrated that ABS found in electronic waste can be taken and granulated down using a hand operated grinder, before using this in a melt extrusion process to generate 3D printer filament. Then the filament can be used to create 3D printable items, including a functional pipe connector part using energy generated from a solar energy generation system (Nano Grid). The preliminary tests confirm the functional operation of the system and its potential to revolutionize the current paradigm of aid delivery, through a more versatile approach that not only works sustainably, but boosts advantages of product offered by AM.



3D PRINTER

All 3D printer testing and modifications were performed to a commercially available FFF machine Lulzbot Mini. This format was selected due to the open source nature of the printer, both with respect to software and hardware, which allowed for modifications to be made with relative ease. The printer was also selected as it was found to be a good compromise of 3D printing size, to power consumption, as assessed from in-house testing. For use in this study modifications were made to the printer to both allow for usability using the Nano Grid system and also using recycled plastics.

CONSUMER WASTE COLLECTION AND GRANULATION

The ABS plastic from consumer waste was reclaimed for test material. The plastic was collected from old desktops, laptops and telephones. Most of the plastic found was free from contamination, but the ones that did, required light cleaning by a damp cloth to remove dust and dirt. The plastic components were broken down in small fragments of 15 cm diameter and then inserted into a hand operated granulating machine where the fragments were broken down to a size of 5mm, which could be served as a filament for the extrusion process.

FILAMENT EXTRUSION

To convert the waste plastics into 3D printer filament, a melt extrusion device was created which served as the core element of the recycling system. The system was based on key elements from commercial melt extrusion systems utilizing a single screw system. The system was internally geared by a DC motor. But, a secondary mode of operation was created using Nano Grid, which would be displayed further in depth. An encoder was used to keep the rotational velocity constant. The screw is coupled directly to the geared motor, which provides a simple and convenient interface where chains are not required. Three individually controlled 50W band heaters are used to vary the temperature distribution along the barrel, to control how the fed waste plastic transitions from solid to the liquid phases. During operation, the motor will rotate the screw, forcing the processed material along the barrel and out through the nozzle. Following extrusion system contains a cooling fan to enhance thermal relaxation. In the current set-up, a 3mm nozzle is used.

NANO GRID SYSTEM

One of the most essential methods for environmental conservation is the generation of electricity from renewable energy. Keeping this in mind, photovoltaic solar panels would be used which would be used to trickle charge lithium ion batteries. In an ideal scenario, the system was aimed to have the capacity to operate solely from the use of the energy generated by the PV's. This would not be realistic in real operational scenarios and so the aim was to create a dynamic system that could operate directly utilizing the energy from the PV cells, and divert excess charge to the lithium-ion batteries. Conversely, in times when insufficient electricity is 84 generated to power a respective device, charge from the battery system can be utilized to sustain operations. An additional fuse and switch were placed into the system as a secondary safety precaution. This would allow for both devices to function in what was termed as 'on grid', using mains electricity, or 'off grid', using the Nano Grid system. The following figure shows a brief explanation of the entire process

CONCLUSION

This study has conclusively demonstrated the Eco printing principle, whereby we realise a low carbon footprint means of recycling consumer waste using 3D printing technology. We have demonstrated that electronic waste can readily be processed using a relatively simplistic process into 3D printer filaments, which can then be used to manufacture mechanically robust parts, such as pipe connectors. The extruder system has demonstrated not only the capacity to convert e-Waste into 3D printer filaments, but can do so with minimal source material to generate filaments . We have also demonstrated the potential of the Nano grid to not only power the 3D printing equipment in real time, but to generate excess energy to charge the systems batteries. We believe with the use of the battery storage system; we can sufficiently supplement the charge generation capacity of the system to allow for indefinite use of the system within reasonable daily usage timescales. However, we have found that the energy generation capacity of the Nano grid system shows considerable fluctuation on a day to day basis. Therefore, further testing of the system is required to better understand energy generation variances over different operational conditions. Finally, we have successfully tested the ability to 3D print parts with the generated waste plastic filament in 'off grid' circumstances. We therefore believe that the EcoPrinting system holds considerable promise as a tool for manufacturing with waste plastics in remote, 'off grid' settings. We hope in future studies to test the principal in actual field tests to better assess the potential of the system.

THE ONE-WAY SPEED OF LIGHT

ANMOL GUPTA

Whenever we are asked the value of the speed of light, the figure that comes to our mind is 299,792,458m/s. But is this value the true speed of light in all directions? Modern studies in physics show that this value may not always be true. Let us understand why.

ANALYSIS

Since 1983 we have accepted the speed of light to be 299,792,458m/s. We are very sure of this calculation that we even have used this speed of light to define how long a meter is. A meter is the distance that a beam of light covers while travelling through vacuum in 1/299,792,458th of a second. But do you know this value is not the true value of light's speed? In Fact no one has ever measured the true speed of light.

Measuring the one-way speed of light is not possible. When we want to measure the speed of an object we require two things, the distance travelled by the object and the time that it takes to travel that distance. But this procedure will not work while measuring the speed of light due to relativistic effects.

Let us look at the problems we may face while measuring the speed of light. Let us take two clocks situated at point A and B separated by some large distance. There is a huge laser installed at point A pointing towards point B. We send the laser beam from point A towards point B and note the time in clock A when laser beam is turned on and the time in clock B when the beam reaches point B. Now we can obtain the time the light beam takes to reach point A from point B. But the important question is will this calculated value of time be correct? For this value of time to be correct , both the clocks must be synchronized.

Since point A and B are far away, we cannot have access to both at the same time. A solution to this problem can be , first bring the second clock at point B to point A and then synchronize them both and then move the clock back to point B. But doing this too will not solve the problem as when the clock starts moving it will start slowing down as we know objects slowdown in time and by the time the clock reaches back at point B it will again be out of sync with clock A.

The final solution is using only one clock at point A and installing a mirror at point B. When light beam travels from A and reaches B it gets reflected from the mirror and again reaches point B. In this way we won't have any syncing clock problem as only the clock present at point A will be used for measurements. But in this style of measurement, we are actually measuring the time light takes to go back and forth from point A to B and B to A and we are assuming that the time light takes to reach point B from A is equal to the time it takes to reach point A from B.

Let's say light took 2x time to complete its one round trip. We are assuming that light takes x time to go from point A to B and the same time x to again reach back at point A. But it may be possible that light takes the complete time 2x to go from point A to B and on reflection the light reaches A from B instantaneously. We cannot discard this

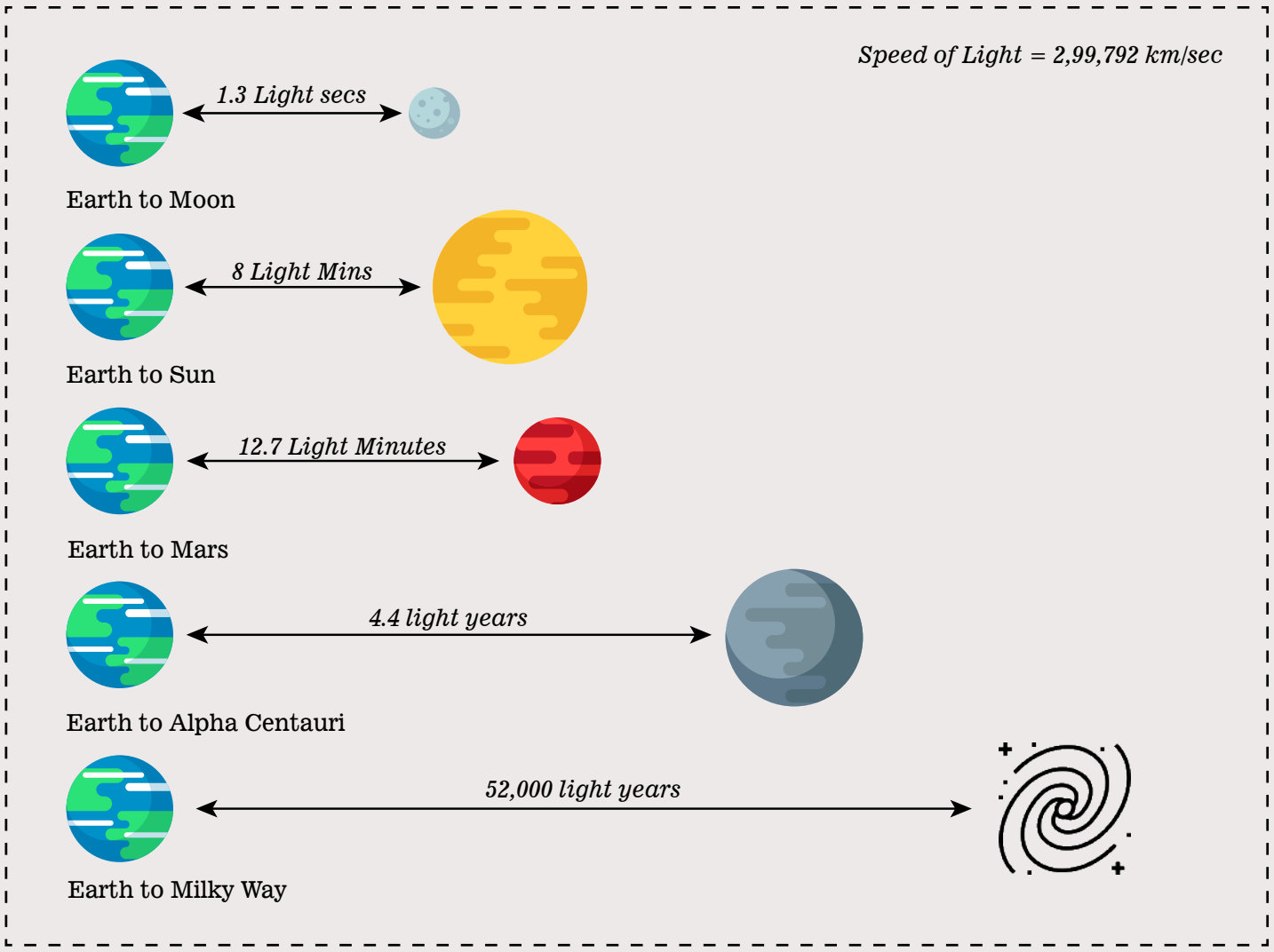
On Aug. 15, 1930 in Santa Ana, CA, Dr. Albert A. Michelson stood alongside the mile-long vacuum tube which would be used in his last and most accurate measurement of the speed of light.

possibility as there are many inconsistencies present in our mystic universe.

One more important thing to understand here is that when we say light we mean any electromagnetic wave, it can even be a radio signal. Let's have a look at an interesting example. Let us assume that there is a person on mars named Alex.

We communicate with Alex through radio waves. Based on the above argument that the speed of light can be different in different directions ; we can even argue that it is possible that the time the radio wave takes to reach Alex from earth is not equal to the time the radio wave takes to reach back earth from mars. It is possible that light reaches back from mars to earth instantaneously and an all-time delay in communication is due to the time the wave takes to reach mars from earth. It will mean that our communication with Alex is delayed while Alex's communication with us is instantaneous. It means that we are observing Alex in real time while Alex is observing our past at the same time which is very mind bending.

Many researchers have tried but failed to calculate the one-way speed of light. What we only know is the average speed of light for one round trip.



CONCLUSION

Whenever we talk about the speed of light, we are talking about its average speed for one round trip, since it is practically impossible to calculate the one-way speed of light. But using this average value doesn't break any law of physics and all calculations done with it work fine. We hope in the future someday a remarkable discovery will take place that will solve this problem and we will be able to calculate the one-way speed of light. The discovery will open many hidden secrets of the universe and change the face of mankind forever.

Artwork by Janis Andzans

SOLAR ENERGY

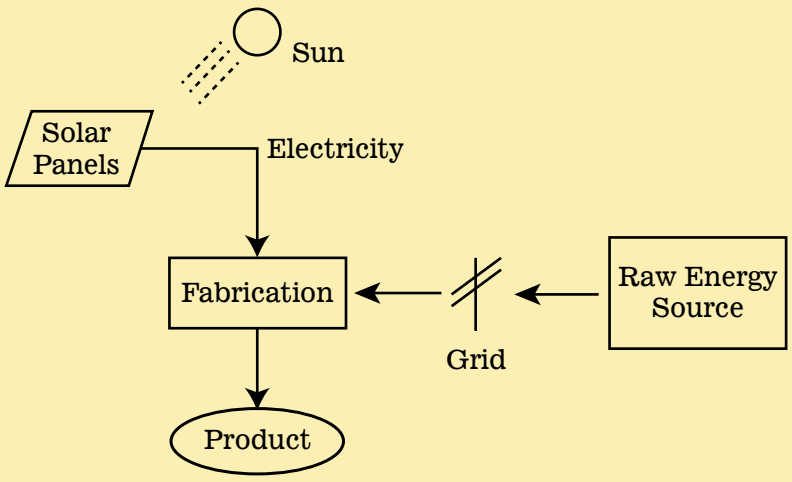
Solar power is a renewable energy source that is used in a negligible amount, contributing less than 2% of the world's energy demands till 2019. Nonetheless, this is a more than 300-fold improvement over the last two decades. The dropping prices and efficiency associated with solar cells, structures capable of converting the sun's energy into electricity, are a primary driver of such a shift. Solar energy is one of the most promising alternatives for reducing global fossil fuel consumption. Environmental advantages and long-term cost reductions for customers have led to a surge in adoption in the Electronics Industry, making solar energy's future highly promising. Students from the ELEX Department have explored and developed a few industrial uses of solar power, which we will focus on in this edition.

SOLAR ENERGY IN OPTIMISING RAW ENERGY USAGE IN FABRICATION

VISHAL THAKUR	VIVEK TIWARI	NEHA VINAMRA	TEERTHRAJ VERMA
	GAURANG VISHWAKARMA	KAUSHAL VISHWAKARMA	

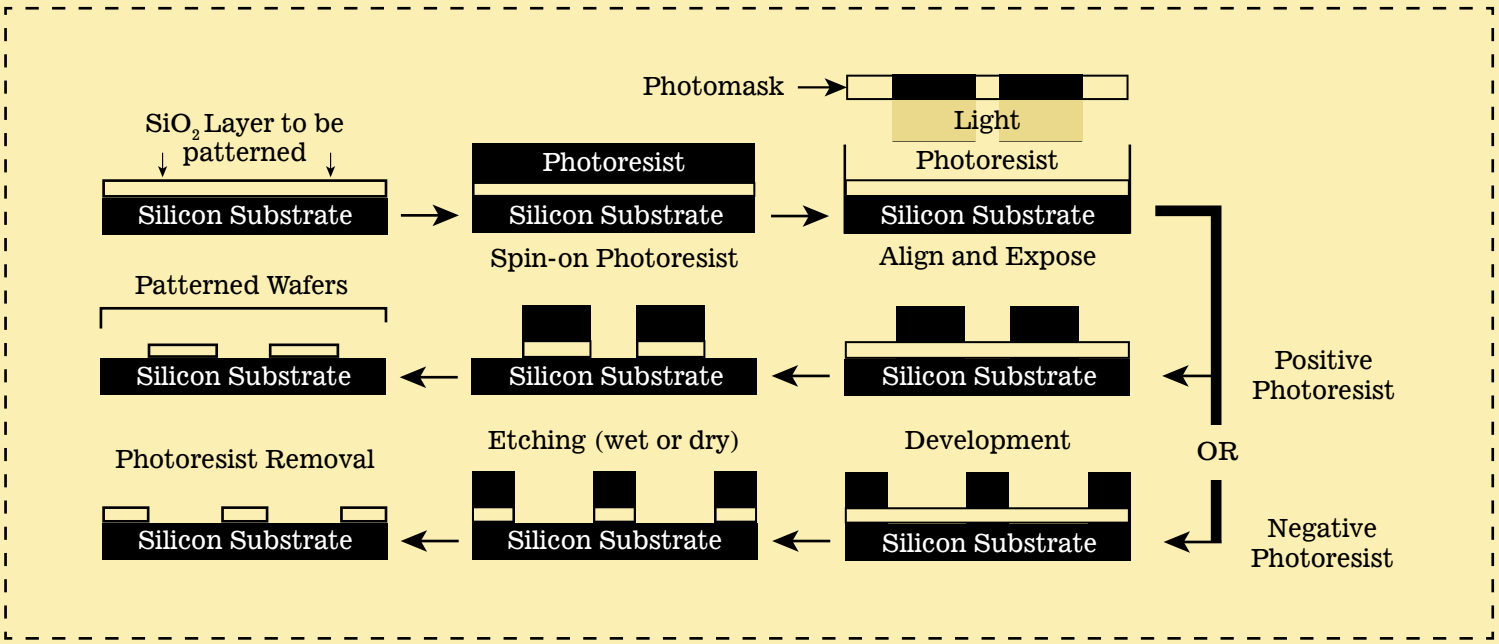
Fabrication in simple words can be defined as a process in which the fabrication industries manufacture semiconductor or Electronics Chips. Fabrication industry can broadly be categorized as a microelectronics industry and fabrication in a complete manner has transformed the microelectronics industry right from chip manufacturing to the production of semiconductors. The introduced system is about the use of solar energy for the fabrication of the chips and semiconductor the purpose of optimization of energy by changing it with solar energy as it will reduce the cost of manufacturing of the chips up to the great extent and it will also help us to conserve the nonrenewable sources of energy. Though it is not possible to replace the traditional sources of energy completely with the solar energy in manufacturing of chips, even replacing it the industries can save huge amounts of money and thus maximize their profits. Solar energy can be simply termed as the technology which is used to harness the sun's energy and convert the harnessed energy into electricity that can be used to power homes, businesses, and industry. Industrial Solar Power Systems have grown in popularity in India and around the world in recent years, owing to significant enterprises turning to solar power to avoid grid outages. With free access in most states, industrial solar power systems are rapidly being employed by the textile, cement, paper, steel, chemical, dairy, and ceramic industries to reduce electricity costs and so maximise profits while also working to improve product quality. Heavy peak usage & large available area make solar a perfect energy solution for industries. The high load requirement and large available rooftop area compared to commercial and domestic consumers make solar a viable alternative for industries. Using solar energy as an alternative source for energy in fabrication industries in India can help in a more convenient and effective way.

IMPLEMENTATION



The present VLSI fabrication method, which is nearing the physical scaling limit, has gate lengths in the 20-nm range. It suggests that devices will be smaller in size, with a greater number of VLSI chips included. Future VLSI technology will ensure the introduction of innovative device concepts for our future progress. Highly pure single crystal silicon is the material used in integrated circuits. It has the shape of a steel grey solid cylinder with a diameter of 10cm to 30cm and a length of one to two meters, depending on the mould used. The produced crystal is then sawed to produce round wafers with thicknesses

ranging from 400 to 600 micrometers. CMP techniques are then used to clean the surface of the wafer. In general, rather than starting with an ingot, most semiconductor manufacturers use prepared silicon wafers in their designs.Furthermore, silicon oxidation was carried out at high temperatures ranging between 1000 and 1200°C. The etching process is continued to permanently imprint the photographic patterns on the wafer. The final silicon wafer has many finished chips or circuits, with over 10 to 108 transistors and chip sizes of up to ten millimeters on a rectangular side. Chips are tested in the automatic probing station, where defective portions are saved for subsequent identification. Dicing is the process of separating circuits from one another and mounting the good ones in packages. Finally, the package is sealed with epoxy or plastic in a vacuum or inert environment. Several of the processes described above are carried out during fabrication. The operation and ongoing maintenance of all equipment and machinery used, including clean rooms and autonomous robots, requires a significant amount of electricity. The approximate value is 100MW/H, which is created by relying on raw carbon-based sources, nuclear power plants, or hydropower plants. Solar energy cannot be relied on entirely, but it can be used to generate a portion of the electricity generated. The panel installation is a one-time expense that will be repaid with free electricity for up to 3-5 years. Solar energy, as a renewable source, not only offers free electricity but also lessens grid pressure and thereby protects the environment with no negative side effects. Fabrication firms can employ solar energy as an alternative source for their manufacturing process to reduce chip production costs and assist in the establishment of fabrication operations in energy-dependent countries such as India. Instead of relying on nonrenewable energy sources for electricity generation, solar energy can be of significant assistance in the manufacturing sector.



CONCLUSION

Solar power is a massive source of immediately useable energy that, in turn, generates various energy resources such as biomass, wind, hydropower, and wave energy. The majority of the Earth's surface receives enough solar radiation to allow for low-grade heating of water and buildings, however this varies greatly depending on latitude and season. Simple mirror devices at low latitudes can concentrate solar energy sufficiently for cooking and even operating steam turbines. In some semiconducting materials, the energy of light causes electrons to shift. This photovoltaic effect has the potential to generate significant amounts of electricity. However, due to the current low efficiency of solar PV cells, very wide areas are required to supply electrical demands. Direct solar energy consumption is the only renewable energy source capable of eventually replacing present global energy supply from non-renewable sources, however it comes at the expense of at least 500,000 km2 of land area. We can notice several benefits in terms of cost, output, and product quality by substituting solar energy with a traditional source of electricity. Solar energy is also a renewable energy source; thus, it will never run out. Though it is not possible to totally replace traditional electric sources with solar energy in practical and large-scale applications, even tiny amounts of replacement will give significant benefits to the sector.

SOLAR FARMHOUSE

SHANTANU KUDAV | JANANI MENON | SWATI KHANNA

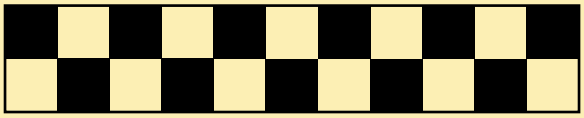
People have been using non-renewable sources of energy for a long time now. But, since these resources are exhaustible, efforts have been made to promote renewable sources of energy that are unlimited. The most convenient source of energy that is readily available almost all the time is Solar Energy. Hence, this project focuses on using Solar Energy in the Agricultural field. The name of the project is Solar Farm House. The idea of Solar Farm House is to create an all-round mechanism that works on Solar Energy and completes basic tasks like water pumping, solar drying system, green house space heating, electricity production, water desalination system and solar sprayers. We researched some of the problems faced by the farmers daily. We also researched about the electric machines that are used by farmers, so that an effective solar replacement can be found for the same. Water pumping requires electricity for the centrifugal pump that pumps the water from under the ground to the water tank for storage. Instead of using conventional electricity, Solar energy can be used to generate electricity for the working of the centrifugal pump. The vegetables and fruits must be dried before storage. A solar collector can be used for creating a warm environment for the drying of those crops. Similar concepts of Solar Collectors can be used for the greenhouses, to create a warm environment. Solar energy can be used in the desalination system, by using solar heaters to evaporate the water from the salt and convert seawater to fresh water which is fit for drinking. Solar energy is used to run the motor which would run the Solar spray that would be used to spray insecticides and pesticides on the crops. All in all, the scope of Solar energy in the agricultural field is vast.

IMPLEMENTATION

The idea behind creating a Solar Farmhouse is to create a self-sufficient farmhouse which has almost all its equipment working on Solar energy. This means that almost all the machinery required from sowing the seeds to harvesting the crop should be powered by Solar Energy.

SOLAR SPRAYERS

Sprayers have a simplified function of spraying the fertilizers and pesticides on the plants. These Sprayers typically consist of a pump that is used to spray the fertilizer. Solar Sprayers consist of solar cells at the top that collect the solar energy and store them in batteries. These batteries can be later used for powering the pump that would spray the fertilizers and pesticides.



SOLAR UNDERGROUND WATER PUMP

Starting with the first step, that is watering the seeds sown, i.e. irrigation, is done using a Water pump. The setup consists of a Centrifugal pump that is fitted below the ground. This pump is powered by electricity. The pump, on receiving electricity, pumps the water up in the storage tank situated above the ground.[7] Usually, conventional sources are used for electricity required for the pump. This is avoided by using PV Solar technology. Solar panels present near the tanks use Solar Energy to generate electricity, which is used for powering the centrifugal pump.

SOLAR GREENHOUSE SPACE HEATING

Greenhouses are used to create a conducive environment for plants to grow in. Solar Greenhouses are more beneficial in the colder regions, typically in the northern region of India. These Solar greenhouses would consist of gaps between the ceiling and the walls for the cool air to enter. Solar collectors situated on the roof of the greenhouse would collect light energy from the sun and use it to run a heater that would heat up the cool air inside the greenhouse using heat energy. This heat energy would be circulated inside the green house. The plants get heated up by the hot air, and this hot air rises upwards and the cool air settles down and gets heated up by the heater and rises upward.

WATER DESALINATION SYSTEM

Another problem faced mostly in the underdeveloped or developing countries is the irregularity of water supply. Not every region in the country would receive enough water. In other cases, the groundwater extracted by the pump in the regions near the seas is mostly saline. It is necessary to desalinate the water before it can be used for irrigation and other purposes. In times like these, a water desalination system is used. Desalination system works on the simple principle of Thermal Solar energy. The saline water extracted by the pump is stored in the storage tank. The top lid of the storage tank is inclined at an angle. The saline water is heated with the help of Solar energy. The salt remains at the bottom and the fresh water evaporates. This evaporated gas is condensed on the lid of the tank. Since the lid is inclined, the water starts sliding on the lid and drips into another tank that collects the fresh water. The water that does not get evaporated due to the heavy concentration of salt and forms Brine solution. This solution can be used for producing liquid fertilizer, which is beneficial for the plants.

SOLAR SPRAYERS

Sprayers have a simplified function of spraying the fertilizers and pesticides on the plants. These Sprayers typically consist of a pump that is used to spray the fertilizer. Solar Sprayers consist of solar cells at the top that collect the solar energy and store them in batteries. These batteries can be later used for powering the pump that would spray the fertilizers and pesticides.

RESULT

An affordable and solar powered Greenhouse is also incorporated in the farmhouse so as to take care of their financial concerns but also make a good bang for the buck. Along with this for women farmers, who according to our research make good use of solar dryerS for a bunch of reasons like, the making of papads, extracting the excess moisture of the crops etc, a solar dryer is also part of the model.

Through the analysis of a survey conducted by the team, we realized that due to the varied vegetation needs of farmers throughout India, curating a selected bunch of equipment for every farmer would not be beneficial. So, we intend to design farmers according to their agricultural needs. Hence, they could select which equipment suits their farming needs the best and it will be included in their own farmhouse. We have tried to cover most of the equipment that will be used within the farmhouse.

Due to the economical and environmental restrictions of the farmers of India, most of them use physical labor more than modern equipment but due to the inexpensive nature of these solar products, it could benefit Indian farmers to a huge extent.

The methodology was designed in a way that every process involved in crop cultivation or even the basic poultry needs is covered. Starting with the irrigation of the crop, a solar powered underground pump is designed, which is used extensively by many farmers of India. But due to the irregular water supply in large parts of India, a solar powered Water Desalination System is designed in order to desalinate underground water and a productive use of Brine Solution can also be obtained. A large chunk of farmers still water their plants manually and do not use sprayers but for farmers who can afford a solar powered sprayer, the farm house also has a designated use for it.

CONCLUSION

The design of a solar-powered farmhouse was initiated with the farmers' economic and environmental constraints in mind. According to a local survey, an analysis was conducted that indicated that not many young people understand the significance of the agricultural impact on GDP, the occupational sector that is essentially the nation's economy. Another finding from the poll indicated that most farmers were aware of the relevance of solar energy, as well as the existence of modern technology and its benefits. However, during the process of incorporating solar energy into our agrarian nation, the majority of the equipment went straight to the industry rather than to the grassroot level. As a result, farmers were unable to put their faith in the procedure.

So an attempt was made to grasp their challenges and restrictions while also using our best knowledge to add equipment that could aid our farmers without appropriating their method.

SOLAR POWERED CALCULATOR

SHANTANU KUDAV	JANANI MENON	SWATI KHANNA	DHARMIK MISTRY
	SARVESH KHETAWAT	ROHIT KAMAT	

Solar energy is the energy obtained by harnessing the Sun's heat and light. Solar energy is energy derived from the Sun. Technology has made it possible to use this bountiful resource in a variety of ways. It is regarded as a green technology because it produces no greenhouse gases. Solar energy is abundant and has long been used as both a source of power and a source of heat. It is an important source of renewable energy, and its methods are roughly classified as either passive solar or active solar, depending on how they capture, distribute, or convert solar radiation into solar power. To harness the energy, active solar approaches such as photovoltaic systems, concentrated solar power, and solar water heating are used. Orienting a structure to the Sun, selecting materials with favourable thermal mass or light-dispersing qualities, and designing rooms that naturally circulate air are all examples of passive solar approaches.

Solar power is a rapidly rising business in India. As of November 30, 2019, the installed solar capacity stood at 32.527 GW. India's success stories demonstrate that the country's compelling commercial case is maximising declining renewable technology prices as the key to future energy decarburization.

RESEARCH

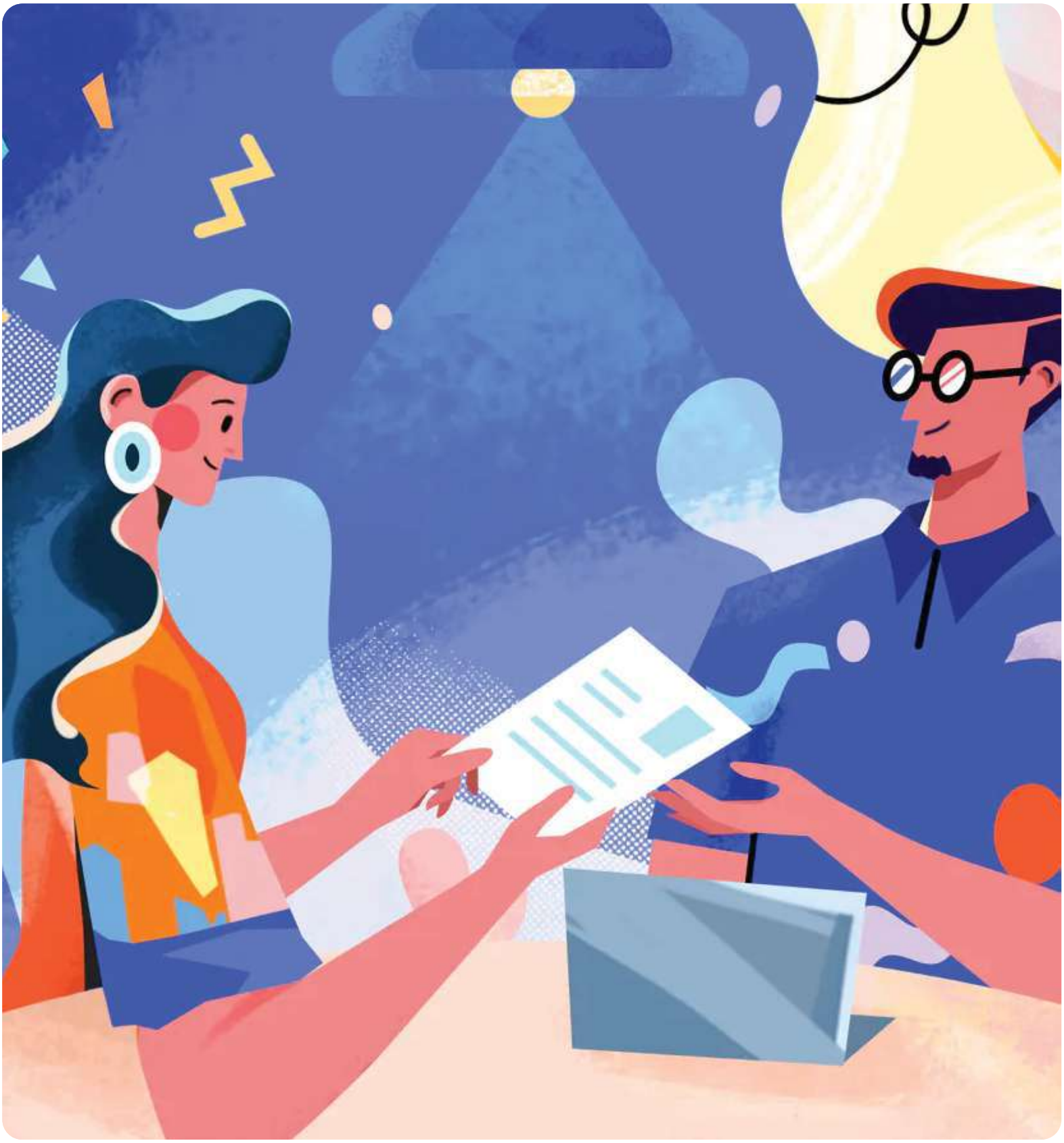
The Value of Solar Methodology represents an opportunity for states and utilities across the country to begin to assess the benefits of distributed generation and better plan for energy investments that provide maximum benefits to society. Different methods to obtain and distribute solar energy includes

Solar photovoltaic cell: A technique that directly converts solar energy into electrical energy. When radiation strikes a photovoltaic cell, it absorbs the light based on the cell's band gap; this absorbed photon makes an electron hole pair, which flows into the external circuit and generates the electric current. The amount of electrical energy produced is determined by internal and external quantum efficiency. The first efficiency represents the conversion of input photons into the number of electron hole pairs, whereas the second efficiency represents the number of electrons that exited the semiconductor after being formed.

Grid tied photovoltaic system: Grid-Tied solar photovoltaic system is identical to any other type of power generation facility that is linked to the grid for electricity transmission. DC power is generated when light strikes the solar panel. This is fed through an inverter, which converts the direct current to alternating current with the same phase, frequency, and voltage as the grid. A grid-connected system is always accompanied with an electrical metre that supports net metering. As a result, the total power generated is the difference between the power generated and the power used by the utility and other facilities required for plant operation.

CONCLUSION

Because it harnesses the strength of the sun's light with little to no gas emissions, solar energy minimises greenhouse gas emissions in the environment. When attempting to create the same amount of KWh per year, solar energy emits far less carbon dioxide into the atmosphere than coal plants. The provision of an infinite supply of energy from the sun is one of the environmental benefits of solar power. Solar energy harnesses the sun's energy while causing no harm to the environment. As a result, solar power has fewer negative effects on health, land use, water, and carbon emissions than other energy-generating methods, such as natural gas in fossil fuel and coal energy plants.



Artwork by Carl Wheatley

INTERVIEW

INTERVIEW WITH

UDAY MENON

Uday is a computer science engineer who completed his engineering degree from TCET and went on to pursue his masters at Technical University in Munich.
After working as a full time software developer at Technokart Consultancy Services, he is now a Working Student at Blickfeld, Munich.

AS WE SEE IT'S USUALLY BECOMING A TREND NOWADAYS MOST OF THE STUDENTS WITH AN ENGINEERING BACKGROUND, IRRESPECTIVE OF THEIR BRANCH OPT FOR HIGHER STUDIES WHAT CAN BE THE REASON FOR IT?

Not only students, but people in general, seek to increase their qualifications. I mean, I think the most important factor would be improving their credentials to secure a job, or let's say a lot of cases I've seen are people who work directly after bachelors and then maybe a year or two later they want some growth in their jobs so they probably opt for masters/ higher studies help them to get senior positions, but I think for me personally it's to learn more, which may sound cliché, but I really wanted to get more in depths into what I can gain as a masters.

AS STUDENTS ASPIRE TO GO FOR HIGHER STUDIES ABROAD, NOT EVERY STUDENT HAS A STRONG FINANCIAL BACKGROUND. WHAT TYPE OF SCHOLARSHIPS IS AVAILABLE TO HELP SUCH STUDENTS?

I mean I don't know specifics about what scholarships are available in for which country but one example I can give is opt for educational visa countries like Germany where education is free it seems impossible but it is and you just have to pay for the living accommodation, what you eat, all other stuff which doesn't amount to a lot of money so you can easily take up student loan for that amount and it should be too much of a hassle let away life to get that paid off but I know people who are not extremely well off and they still go to the US may be like you can through loans for that and it can be easily paid off once you get a job there it's just that takes some time I guess but about the scholarships, I have no ideas as what scholarships are available and stuff. I am sorry!

ALMOST EVERY PERSON ASPIRE TO GIVE THE GRE/ GMAT AND OTHER COMPETITIVE EXAMS LIKE GATE WHAT DO YOU THINK IS THE IDEAL TIME TO PREPARE FOR THE SAME IN THE 4 YEARS?

For example, for GRE, English is something that a lot of people say is very difficult to get right and you can't do it in a couple of months since it's a very lengthy process, we really have to dive deep and read a lot more which you can easily do with the help of audible books. Just be consistent and learn little by little each day. Whereas subjects like Math, can be done in the last year itself since the syllabus comprises of basic engineering Mathematics. So you must manage your time efficiently and prepare a different structure on the basis of different subjects making sure that atleast your basics are clear.

WHAT ACCORDING TO YOU SHOULD BE THE RIGHT CHOICE AMONG THE VARIOUS HIGHER STUDIES OPTIONS LIKE MBA OR MS OR M.TECH?

No one size fits all solution, right? Everyone does not do some random type of engineering; people do engineering that they enjoy and are passionate about. I mean, there is no one path, and I can't just tell you what everyone should do. M.TECH it depends on what you want to do in the future as a job if you want to go into management then you go into an MBA course if you really want to do research maybe you go into a University that supports research and there are more research opportunities for Ph.D. something like that you could go M.TECH crowd and just get your masters and you could end up in Senior position there are multiple choices it's up to you.

WHAT DO YOU THINK IS THE IMPACT OF COVID-19 ON THE STUDENTS PLANNING TO GO ABROAD FOR THEIR HIGHER STUDIES?

In the beginning, a lot of people had issues that they had to start online education and attend their courses online well I guess it is improving now for students it shouldn't really matter whether Covid-19 is not impacting that much right now here from what I heard people are travelling to wherever they want to go for higher education as I think even a couple of weeks ago some of my friends they went to the US and started their education in an education institute in an offline setting.

WHAT ADVICE WOULD YOU LIKE TO GIVE TO STUDENTS WHO ARE IN THE SECOND YEAR OR THIRD YEAR OF ENGINEERING AND PLANNING TO PURSUE HIGHER STUDIES?

I would advise you to increase your co-curricular and curricular activities and learn from new technologies, rather than just the thing that is thought, as I don't know what exactly is thought in TCET in the second and third years. Project-based learning is unquestionably the most effective way to learn any language. So that's a plus. I mean, I guess you should focus on making and building small projects in whatever language you want about whatever knowledge you would like. It's best to start building a small project on anything, upload it, and start pushing it on GitHub.

You may work and get StackOverflow and see a solution to challenges and some employers even look at it if hiring at a higher level, they look at StackOverflow it's just that I know conceptually providing exam and things is important but also focus on doing it practically You must understand how to set up an application, such as the base of an application, or simply stay up to date on the latest trends and technologies to see what is good and what is bad and what can be used for what scenarios. These are key questions you must understand and know the answers to if you want to be a successful software developer or whatever it is.

ANY TIPS FOR THE CURRENT BATCH OR FUTURE BATCH OPTING FOR HIGHER STUDIES?

I would just say that be well prepared for what you have to work for because it is better to be overprepared than underprepared because a lot of people go to masters thinking that they will deal with it along the way and they don't have any proper base. I know people who have taken masters without the complete knowledge of basic programming language and then they struggle a lot with the amount of stuff they have to do. So it's best to have your basics clear and your foundation set so that it doesn't matter what area of engineering you're in in the long run.

INTERVIEW WITH

PRANOTI WAINGANKAR

Pranoti pursued her BE in Electrical and Electronics Engineering at TCET and went on to complete her MBA at MICA University.
She is currently working as a full time principal, adivisory and insights consultant at Gartner in Bengaluru

WHAT KIND OF ATTITUDE OR PERSONALITY AN INTERVIEWER EXPECTS FROM AN INTERVIEWEE?

For this I would break down the answer into two parts, first is the way you present yourself in the interview and the second is the soft skills that you carry. When it comes to presenting yourself the main point that is noticed is confidence. One must be confident enough even if they feel that they haven't prepared well. The interviewer notices very keenly about The way you greet them and the confidence that you show. It will show them that you have a warm and inviting personality and you've basic professional etiquette. The second aspect is the soft skills, where the interviewer would ask if you know certain skills or not. In this case, saying no directly would hamper the impression, rather showing the curiosity to learn that skill so that it benefits the organization that you're interviewing for creates the impression that you're ready to learn and willing to pick up and put in effort for that skill. The next thing that they might expect is your response to stress and how you work under pressure. They might ask any question out of the box which might put you in a state where you have to think deeply. In such cases, you mustn't panic and not lose your cool. If they ask you something which you don't know, take some time to think about it or ask them to elaborate it so that it gives you an idea.

WHAT TYPE OF BASIC KNOWLEDGE IS EXPECTED FROM A PERSON OF ELECTRONICS ENGINEERING BACKGROUND FOR AN INTERVIEW?

It totally depends on the type of interview you're applying for and the company that takes the interview. Most of the time what they expect you to have is basic knowledge regarding the job you're applying for and your problem-solving abilities. They also tend to check your technical and non-technical skills and judge you on a basis.

ANY TIPS FOR THE STUDENTS WHO ARE GOING TO GIVE ANY INTERVIEWS ANYTIME SOON?

First and foremost you should know why you are giving the interview because the interviewer will ask you the reason behind this role and you should keep an answer ready which convinces

the interview was so that he or she goes ahead. Next is to ask your seniors who are already in the job so that they tell you about the interviewing process and will let you know about the appropriate skills required to Ace the interview. Third, always make sure that you think and answer the questions that the interviewer asks, do not panic, do not show less confidence, and make sure that you do not give vague answers. The interview was might also ask some tricky questions so you take your time to formulate the answer. Also give a background check of the company you are giving an interview of, so that you get to know about your policies, future projects, new openings, contracts, and skillsets required where you could potentially be of some benefit for the organization so that the person who's taking the interview realizes that you've don't you're homework and is fit for the job. Next is always be honest while creating your CV, mention only those skills which you're through with so that if at all the interviewer asks any questions related to it, you'll have an answer ready.

HOW TO CHOOSE THE CORRECT CAREER PATH?

During you're years of engineering you'll get to know the subjects that you like or the topics of your interest. Create a list of things that you enjoy learning and would like to take it ahead by creating a career out of it. When I was in my third year I made a list of the things that I liked and would like to pursue ahead as it gave me the potential to think broad and give impetus to what I like and so what I found suitable was MBA. If you're a person who loves technical work, who enjoys getting hands-on experience so doing masters in a focused stream would help. And if you're a person who doesn't have any clarity in life right now and hasn't thought about what has to be done ahead, the best thing is to get a job. During the job, you'll definitely get insights regarding where you're right now and what you would like to pursue ahead and when you realize that the next step that you should figure out is the things that are required for it, like education, experience, certain courses, etc. And it's absolutely fine to set up short-term targets, mid-term targets at your convenience. And remember not having any answers is also fine, don't feel ashamed of it, it'll only enable you to learn more and more things so that you finally understand where you Fit in. Last but not the least, don't stress about getting placements and all, prepare consistently and smartly, and stay cool!

INTERVIEW WITH

ADITYA SINGH

Aditya completed his Electronics engineering degree in TCET and is now currently working in Zycus.

WHAT IS YOUR EXPERIENCE WITH YOUR FIRST JOB UP TO THIS POINT?

Because it was my first job, I was nervous. But by keeping an open mind, I was able to gain an advantage. When you start a new job or switch jobs, you are stepping outside of your comfort zone. For the past four years of my engineering career, I had been in my comfort zone, and when it came to finding work, I had to step outside of it. It was difficult at first to become acquainted with the new environment, but as I previously stated, I kept an open mind, and now, after one and a half years, I believe I am completely acquainted with it because I now understand how the company operates and what I do, and I am also familiar with the new environment. The desire to learn in an open environment also aided me greatly.

HOW DID YOU MANAGE TIME AND MOTIVATE YOURSELF?

Time management is essential not only during placements but also in your corporate life because you are paid by the hour - this is a new term I learned where you divide your entire month's salary by 24 to find out how much you are paid per hour. So that motivates me to keep my time in place, and how I used to manage time was by reading a lot of time management books because they actually help you a lot and talk about techniques and processes that anyone can adapt. I then prioritised my tasks. Whatever it is, the tasks that you complete not only in college but also in your daily life are critical.

So, during my placements, prioritising tasks was extremely beneficial to me. And I analysed it by considering the consequences of not completing these tasks on a priority basis. The next thing that motivated me was to be placed before the eighth semester, that is, during my seventh semester, because I wanted to enjoy my final semester of college.

WAS THERE ANYTHING DURING YOUR PLACEMENT THAT MADE YOU THINK, "I WISH I HAD KNOWN THIS SOONER!"?

Yes, absolutely! Previously, I had never bothered to compile a list of the companies that would visit the college. So I didn't know which companies came to the college, what their

selection ratio was, and so on. Things would have been much easier for me if I had done this earlier. The next mistake I made was to keep a generic resume regardless of the domain or company that came to the college. The third issue was a lack of a network. You must maintain contact with your coworkers, your supervisors, your teachers, and anyone else who can help you.

ANY TIPS OR SUGGESTIONS FOR STUDENTS?

- Get yourself a LinkedIn profile and start building your network
- Start working on your actions rather than just thinking about it and procrastinating
- Research about the company before you go for the interview
- Ask for referrals from people who are already in that company

TOPPERS

FIRST YEAR

DISHA GARJE
9.50

SIDDHI SAWANT
9.50

SANDESH GAVALI
9.50

SECOND YEAR

SHRUTI BAJORIA
10.00

PRITIKA GHARAT
10.00

SHANTANU KUDAV
10.00

RITIK SINGH
10.00

THIRD YEAR

MANSI MISHRA
9.79

ABHISHEK SINGH
9.78

ISHAAN SHINDE
9.68

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THANK YOU