HORIZON

A comprehensive research and tech magazine 2020

SVCE | Sri Venkateswara College of Engineering

SRI VENKATESWARA COLLEGE OF ENGINEERING

Sriperumbudur–602 117

(AUTONOMOUS-AFFILIATED TO ANNA UNIVERSITY)

VISION ◄◄◄

To be a leader in Higher Technical Education and Research by providing the state of the art facilities to transform the learnersinto global contributors and achievers.

MISSION ◄◄◄

To develop SVCE as a "CENTRE OF EXCELLENCE" offering Engineering Education to men and women at undergraduate and postgraduate degree levels, bringing out their total personality, emphasising ethical values and preparing them tomeet the growing challenges of the industry and diverse societalneeds of our nation.

DEPARTMENT OF INFORMATION TECHNOLOGY

►►► VISION

To produce higher calibre technologists and scientists for helping the country to attain new heights in Information Technology research and industrial needs to provide leadership in the field of technical education.

►►► MISSION

1. To develop the department into a "Centre of Excellence in Information Technology" offering engineering education to the students at Undergraduate, Postgraduate and Doctoral degree levels.

2. To build students' total personality emphasizing ethical values, and nurture them to meet the growing challenges in the InformationTechnology industry.

3. To examine the research challenges and cater diverse societal needs of the Nation.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The B.Tech Information Technology programme has the following Programme Educational Objectives(PEOs):

1. The graduates of Information Technology program will demonstrate themselves as leading professionals.

2. The graduates of Information Technology program will be equipped with the necessary skills to become proficient researchers.

3. The graduates of Information Technology program will demonstrate their abilities as successful entrepreneurs.

4. The graduates of Information Technology program will excel in higher studies or modern administrative services.

PROGRAMME OUTCOMES (POs)

1. Engineering Knowledge: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

2. Problem Analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. Design / Development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAMME SPECIFIC OUTCOMES (PSOs)

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1. Exhibit proficiency in examining standard business operations in order to create and implement suitable Information Technology solutions.

2. Demonstrate the ability to establish an IT infrastructure, effectively manage resources, and ensure data security.

About the Department

In 1996, Sri Venkateswara College of Engineering pioneered the introduction of the B.Tech degree programme in Information Technology under the affiliation of University of Madras. This is the first of its kind in Indian Universities. The department fulfills the requirements for the award of B.Tech Degree of Anna University. The Venture was initiated under the guidance of our patron Dr. A. C. Muthiah and with the blessings of the Kanchi Paramacharya. When we started, the batch size was 30. This increased to 60 in 1998 and scaled up to 120 by the year 2000. Our growing numbers is indicative of the highly qualified and extremely dedicated teaching faculty of the department who strive for excellence in every sphere of their expertise. It is the constant endeavor of the department to be in touch with changing needs of the IT industry so as to be responsive in terms of modifications and introduction of new courses to adapt to these technological changes.

Message from the Secretary

Dr. M. Sivanandham
SECRETARY

Information Technology is a field that is so dynamic and evolving. This is an era dominated by Information Technology and professionals specialized in this field are always in high demand. IT specialists, apart from having sound technical knowledge, must have good problem-solving and logical reasoning skills, as well as have excellent communication skills. These characteristics of an IT professional demand periodic update of IT knowledge. I am happy to learn that the Department of Information Technology of SVCE is bringing out a magazine featuring changes in this filled, including innovations and inventions. I am sure that this magazine will not only involve in the dissemination of new knowledge but also inspire others to get involved in active research to solve industrial and social challenges. I wish the Editor and Editorial Team a great success in their effort to start this magazine and continue to keep it as the best IT Technical magazine

Message from the Principal

Dr. S. Ganesh Vaidyanathan
PRINCIPAL

Technology today has found its way into even those walks of life that a decade back was considered untouchable by technology. The world has seen many innovations and inventions. It has not reached saturation and never going to. These inventions and innovations lose their meaning or purpose when they do not reach the masses. The Department of Information Technology has come up with a novel idea to release a magazine with details of all research work done by the faculty members and the students in the IT department, apart from introduction to the latest technologies happening in the world. I'm sure that the magazine will succeed in its purpose. I congratulate the Department on their initiative and wish them luck and success in this venture.

Dr. V. Vidhya
HEAD OF DEPARTMENT

Sri Venkateswara College of Engineering was the pioneer in introducing the B.Tech degree programme in Information Technology under the affiliation of the University of Madras in 1996. This was the first of its kind among Indian Universities. The department that inducted with 30 admissions has gradually increased to 120 in strength from the year 2000. The department specializes in giving students both theoretical and a hands-on grasp of the latest in information technology, to ensure that they hold their own against any and every challenge by ever-evolving industry. As Information Technology is a very dynamic and evolving field this course is designed to provide strong preparation in the fundamental concepts and at the same time, providing maximum flexibility to accommodate student interests and contemporary developments. Over the years this enthusiasm has resulted in the department being awarded several government research grants and endowments, from the likes of DRDO and ISRO. In the year 2016, Sri Venkateswara College was designated a National Resource centre under the National Cyber Safety and Security Standards, New Delhi. This centre is being managed by the Department of information technology from the time of its installation. An undying quest and ever-growing passion to update technical knowledge have been the two great distinctive characteristics instilled in the students of the department. I am proud to present the Horizon-our student research magazine. It will give you a glimpse of research areas covered by our students and faculty till date. I'm sure that it will serve as an eye-opener and inspire the researcher in each one of you and propel you to a greater and new dimension in life.

The Student Council

2020-2021

Athayee Elayappa Award
winner

Ms. Kaaviya Baskaran
2020-2021

From the Editor
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Divya T
IV Year IT Student

Greetings Readers!

Technology has become part of our daily lives not just as a way to improve lives, but as an integral part of it. The advancements in technology cannot be ignored because they are one of the most exploring and contributing elements of society. As technology advancements are unending, it is imperative that we in this technology-obsessed world understand the incredible changes this technology is bringing about. With the growing need to explore the knowledge in the field of technology, I hereby present to all the third edition of HORIZON. The HORIZON is a great effort by the Department of Information Technology to keep readers up-to-date on technology developments and their usefulness. It has given me immense pleasure to be the editor of this magazine. Moreover, I would like to extend my gratitude to the faculty in-charge for continuous guidance throughout the process. Thanks to all the great thinkers and writers who dedicated their time and knowledge to this magazine.

Faculty In-charge
....

Ms. P. Leela Rani
Assistant Professor / INT

HOW APIs HAVE MADE YOUR "ANNACHI" KADAI COMPETE WITH RELIANCE/ AMAZON?

VIGNESH S

Product head - API and Integrations, Freightify

Application programming interfaces — more commonly known as APIs — are at the heart of the most successful digital companies, powering everything from Amazon's cloud business to Google ads to Facebook likes. APIs enable mobile experiences, connect companies on the web, and enable platform business models. The idea of an "API economy," in which APIs create new value for companies, is over a decade old, and many established enterprises correctly view APIs as a key to unlocking their digital transformations. But it's not just the digital giants that can benefit from APIs.

While we're firmly living in the digital age, businesses whose success predated the web have struggled to adapt to the digital business paradigm, a fact underlined by the urgent need for digital transformation brought about by the Covid-19 pandemic. Pandemic has forced the shops to be closed and operate remotely through delivery. Since they aren't equipped with handling the instant request through online mode and quick-fire delivery.

With Jiomart and Amazon are betting big on this market at a scale and a time when they can technologically enable and digitize critical processes in informal retail — inventory management, order management, payments, loyalty rewards and accounting taxation — revolutionizing the sector.

CHALLENGE

As a kirana store I have walk-in customers who gets day-to-day groceries and household essential items. For few customers we will deliver as per their convenience. But since the shops are closed, all the customers have started bombarding with orders through phone or Whatsapp, thus making the operations tiresome.

SOLUTION

Then, there comes the API!
APIs have allowed retailers to be more accessible to their customers with services such as order online and pick up in-store, curbside pickup, fulfillment of orders through delivery partners, personalized recommendations while shopping online, etc. These capabilities have been especially important over the last year, as the world has changed at a rapid pace. With many changes to customer interactions yet to come, APIs will continue to play a pivotal role in helping retailers to further personalize digital experiences and streamline their operations.

WHAT'S IN IT FOR THE RETAILERS?

DELIVER PERSONALIZED CUSTOMER EXPERIENCES

Retailers are using APIs to create interactive and predictive personalized experiences. These range from "magic" mirrors that reflect personalized clothing, accessory, and even makeup suggestions; to smartphone alerts that encourage shoppers to check out special items while they're browsing in the store; offers of coupons; and more. Behind the scenes, APIs interconnect between the store and consumer data, business intelligence, and application security to bring these innovative experiences to life.

DIGITAL PAYMENTS

Since merchants use the online payment services to receive digital payments for online orders, it might be possible to nudge them to pay their other suppliers digitally or accept digital payments from walk-in customers.

STREAMLINE RETAIL OPERATIONS

APIs can help any retail business to operate more efficiently, from human resources, customer service, and distribution, to invoicing, marketing, and compliance. For example, APIs make it super easy and simple to onboard, manage and train employees and contractors. They can help warehouse operations for use cases like tracking real-time package status and gathering consumer shopping insights.

LARGER CUSTOMER BASE

Other than the local customers, with the power of connectivity, the proximity which the kirana store can cover has increased and matched online customer demand to inventory within its network of stores, enabling merchants to serve a larger customer base, beyond walk-ins. By acting as a local warehouse and fulfilling orders, merchants create additional revenue streams.

CONCERNS ABOUT DATA PRIVACY

One potential concern — already a thorny issue for the digital ecosystem — is that of data privacy. It's clear what types of retailers might exchange or how these data will be used. A draft data privacy bill is pending comments from a parliamentary committee. With technological advancements, I feel this will be handled well.

CONCLUSION

Jio Platforms has attracted a series of investments. Earlier this year, Google made a $4.5 billion investment and aims to help Jio develop entry-level smartphones that run on Android for low-income customers. And JioMart isn't the only player in the market wooing small retailers. Amazon with its "Local Shops" program, Flipkart with its seller program, Google with its spot platform and are unfolding plans to woo local stores along with different parts of the digital value chain. Enough reasons exist to think that this digital API journey could be beneficial to small business owners in the long run.

GENERATIVE ADVERSARIAL
NETWORK

PRAGATHEESHWAR S
I Year IT Student

A generative adversarial network as a class of machine learning framework. Given a training set, this technique learns to generate new data with the same statistics as the training set. For example, a GAN trained on photographs can generate new photographs that look at least superficially authentic to human observers, having many realistic characteristics. The core idea of GAN is based on the "indirect" training through the discriminator, another new neural network that is able to tell how much input is "realistic", which itself is also being updated dynamically. This means that the generator is not trained to minimize the distance to a specific image, but rather to fool the discriminator. This enables the model to learn in an unsupervised manner.

GAN APPLICATIONS

GAN can be used to generate art. The images created by GAN have become the defining look of contemporary AI art. GANs can also be used to paint photographs or create photos of imaginary fashion models with no need to hire a model, photographer or makeup artist, or pay for a studio and transportation. GANs have been proposed as a fast and accurate way of modeling the high-energy jet formation and modeling showers through calorimeters of high-energy physics experiments. GANs reached the video game modeling community as a method of up-scaling low-resolution 2D textures in old video games by recreating them in 4K or higher resolutions via image training and then down-sampling them to fit the game's native resolution (with results resembling the supersampling method of anti-aliasing). With paper training, GANs provide a clearer and sharper 2D texture

image magnitudes higher in quality than the original, while fully retaining the original's level of details, colors, etc.

As we all know, more and more technology increases threat also increases proportionally. Concerns have been raised about the potential use of GAN-based human image synthesis for sinister purposes. For example, to produce fake, possibly incriminating photographs and videos. GANs can be used to generate unique, realistic profile photos of people who do not exist in order to automate the creation of fake social media profiles. The State of California considered and passed an act on October 3, 2019, which bans the use of human image synthesis technologies to make fake pornography without the consent of the people depicted, prohibits the distribution of manipulated videos of a political candidate within 60 days of an election.

CRYPTOJACKING — A CYBER SECURITY THREAT

Indumathi A
Assistant Professor / INT
Sangeetha G
Assistant Professor / INT

Cryptojacking is a serious cybersecurity threat. It refers to the act of using our computer or Smartphone without our permission. The Internet has been awash in Cryptojacking craze, which has forced site owners to implement Cryptojacking systems intentionally or after a hack. Cryptojacking malware can overwhelm your system, causing you a great deal of trouble, which negatively impacts your customers. A computer that has Cryptomining software installed on it is considered compromised. In the healthcare industry, even without access to sensitive data, it is defined as a data breach, which comes with its own set of implications.

During 2017-18, cryptojacking scams dominated the news but no longer exist now. This year has seen a surge in cases due to the increasing popularity of cryptocurrency. A report from security firm Kaspersky has shown a rise in cryptojacking cases for the first quarter of 2021. There were 432,171 users who encountered mining software on their mobile devices in the first quarter of 2021, the report shows. As of January, there were 187,746 and as of March, there were 200,045. The rise wasn't noticed only by Kaspersky. Japanese tech firm NTT says crypto miners made up 41% of all detected malware in 2020, a figure that tech firms haven't seen for a long time. Basically, the surge in cryptocurrency prices drew greater numbers of users to the field, which made it easier to trade and transact, increasing the need for cryptocurrency mining.

A cryptojacker's activities are virtually invisible unless you know what to look for. In a similar way to a ransomware attack, cybercriminals send malicious links via phishing emails. In the meantime, when the victim clicks the link, the crypto mining code is downloaded to their computer without their knowledge.

As soon as it is installed, it utilizes the system's CPU in tandem with hundreds or even thousands of other infected computers in order to mine cryptocurrency. It works in the background, slowing the computer down, making it hotter and consuming more power. A typical, everyday process, such as web browsing, may run slowly if you have been affected by such malware. There will be no noticeable difference in performance or power spikes. Infected computers, however, can exponentially increase an organization's electricity bill. The journal Joule recently published a study that found that the energy used for crypto mining doubles every six months.

A variety of strategies may help, such as monitoring CPU usage, updating antivirus and firewall software, removing inactive software and devices from a network, and obtaining cyber liability insurance from a trustworthy source. Similar to other malware, it is also possible to detect and avoid such scams. It is advisable to avoid clicking on links in email messages, text messages, etc. Furthermore, many attackers create fake websites that claim to reward website visitors with crypto for clicking a button - it's wise to stay away from those, too. A good antivirus program ensures that known cryptojacking malware is detected before it can harm you.

6G WIRELESS TECHNOLOGY

FRANCIS INIGO RAJ L
Instructor / INT

6G (**sixth-generation wireless**) is the successor to 5G cellular technology. 6G networks will be able to use higher frequencies than 5G networks and provide substantially higher capacity and much lower latency. One of the goals of 6G internet will be to support one microsecond-latency communication.

It facilitates seamless communication and will make the world feel like one giant village. In addition, the 6G network will likely support applications like Virtual Reality and Augmented Reality (VR/AR), Artificial intelligence, and the Internet of Things (IoT).

WHAT ARE THE ADVANTAGES OF 6G OVER 5G?

6G (at speeds of **~95 Gbit/s)** is expected to support data rates of **1 terabyte per second**. That's a thousand times faster than 1 Gbps. Access points will be able to serve multiple clients simultaneously via orthogonal frequency-division multiple access.

This level of capacity and latency will extend the performance of 5G applications and expand the scope of capabilities to support innovative applications in wireless connectivity, cognition, sensing and imaging.

6G's internet speed is **100 times faster than 5G**. Telecom companies in India are currently testing 5G now. 6G is going to allow data transfer speeds up to **100 gigabytes per second**.

WHEN WILL 6G INTERNET BE AVAILABLE?

6G internet is expected to launch commercially in 2030. The technology makes greater use of the distributed radio access network (RAN) and the **terahertz** (THz) spectrum to increase capacity, lower latency and improve spectrum sharing. China has reportedly put the world's first 6G satellite into orbit. It has already started testing the six-generation technology from space using a high-frequency terahertz spectrum.

4G VS. 5G VS. 6G

Network	Speed	Supported devices
4G	Approx. 33.88 Mbps (500 Times of 3G)	Mobile phones, tablets, hotspots
5G	40–1,100 Mbps	Mobile phones, tablets, hotspots, public infrastructure, automated cars
6G	Up to 1 Tbps (1,000,000 Mbps)	Automated cars, cellular surfaces, Wi-Fi implants

HOW WILL 6G WORK?

It's expected that 6G wireless sensing solutions will selectively use different frequencies to measure absorption and adjust frequencies accordingly. This method is possible because atoms and molecules emit and absorb electromagnetic radiation at characteristic frequencies, and the emission and absorption frequencies are the same for any given substance.

6G will have big implications for many governments and industry approaches to public safety and critical asset protection such as:
- Threat detection;
- Health monitoring;
- Feature and facial recognition
- Decision-making in areas like law enforcement and social credit systems;
- Air quality measurements; and
- Gas and toxicity sensing.

Improvements in these fields would also benefit mobile technology, as well as emerging technologies such as smart cities, autonomous vehicles, virtual reality and augmented reality.

DO WE EVEN NEED 6G?

The sixth generation of cellular networks will integrate a set of previously disparate technologies, including deep learning and big data analytics. The introduction of 5G has paved the way for much of this convergence.

The need to deploy edge computing to ensure overall throughput and low latency for ultra-reliable, low-latency communications solutions is an important driver of 6G. The need to support machine-to-machine communication in the internet of things (IoT) is also a driving force.

ADVANTAGES OF 6G TECHNOLOGY

- Supports Higher Number of Mobile Connection
- Supports Higher Data Rates
- Revolutionize the Healthcare Sector
- Independent Frequencies
- Large Coverage

DISADVANTAGES OF 6G TECHNOLOGY

- Difficult to use
- Expensive
- Privacy
- Compatibility issues
- Negative Impact on Health

CONCLUSION ON PROS AND CONS OF 6G NETWORK

6G Network technology is a new and exciting advancement that will be very useful in the future for businesses and government institutions. Lightning-fast speed also ensures that there will be fewer communication issues in the remotest areas. As for the pros and cons of 6G technology, more scientific evidence would clear the picture.

Even though 6G networks aren't expected to be operational until at least 2030, research has already started on seventh-generation (7G) wireless technologies.

7G technology will represent a quantum leap in bandwidth to support ultra-dense workloads. For example, 7G has the potential to enable continuous global wireless connectivity via integration in satellite networks for earth imaging, telecommunications and navigation. Enterprises could implement 7G to automate manufacturing processes and support applications that require high availability, predictable latency or guaranteed quality of service.

Compared to 6G, 7G is designed to do the following:

- Delivers data up to 46 Gbps nearly five times the rate of 6G projections;
- Double the size of the channel to 320 MHz; and
- Afford 16 spatial streams, compared to eight in 6G.

BLOCKCHAIN
THE FUTURE TECHNOLOGY

DEVI N Assistant Professor / INT
LEELA RANI P Assistant Professor / INT
GURU GOKUL AR Assistant Professor / INT

Even with a 'Block' in its name, blockchain technology has erupted into a buzzword in the IT sector. Blockchain is considered to be the future technology. The concept behind blockchain was first proposed by a group of researchers in 1991. The idea was initially intended for time-stamping digital documents such that backdating them will not be feasible thereafter. However, the bitcoin built using that idea became popular after it was proposed by Satoshi Nakamoto in 2009 and the core technology behind it gained a lot of attention. Blockchain is a distributed database or a public registry that keeps details of assets and its movements/transactions across a Peer to Peer network. Every transaction will be encrypted using a Cryptographic Algorithm (usually SHA 256 or SHA 512) and all the transaction history will be grouped and stored as blocks of data. The entire block content is encrypted and linked to the successor block, thus securing the previous block data from modification. The entire process will build an unforgeable, and permanent record of the transactions that happened across the network.

Additionally, these blocks of records are copied to every participating node in the network, so everyone will have access to it. The huge benefit of blockchain is that it can store any kind of asset, its ownership details, history and location of assets in the network whether it is the digital currency bitcoin, or any other digital assets like a certificate, personal information, a contract and even the real-world objects. The powerful trait of Blockchain is that we can create a shared reality across non-trusting entities which means the nodes participating in the network need not know or trust each other as the individual nodes have the ability to validate the data themselves. The irony is that the mutual distrust among nodes is the thing that keeps the blockchain secure and verified.
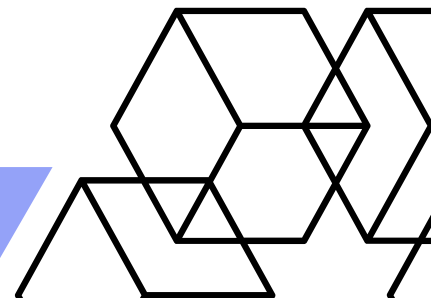
IBM QUANTUM CHIP

FRANCIS INIGO RAJ L
Instructor / INT

Recently, IBM introduced the high-speed computational quantum computer chip named Eagle, a 127-qubit quantum processor which will help users to explore the uncharted computational territory.

Unlike regular computer chips, which encode information as 0 or 1 bits, quantum computers can represent information in something called qubits, which can have a value of 0, 1, or both at the same time due to a unique property called superposition. That means that each added qubit raises the potential processing power exponentially.

By holding over 100 qubits in a single chip, IBM says that Eagle could increase the "memory space required executing algorithms," which would in theory help quantum computers take on more complex problems.
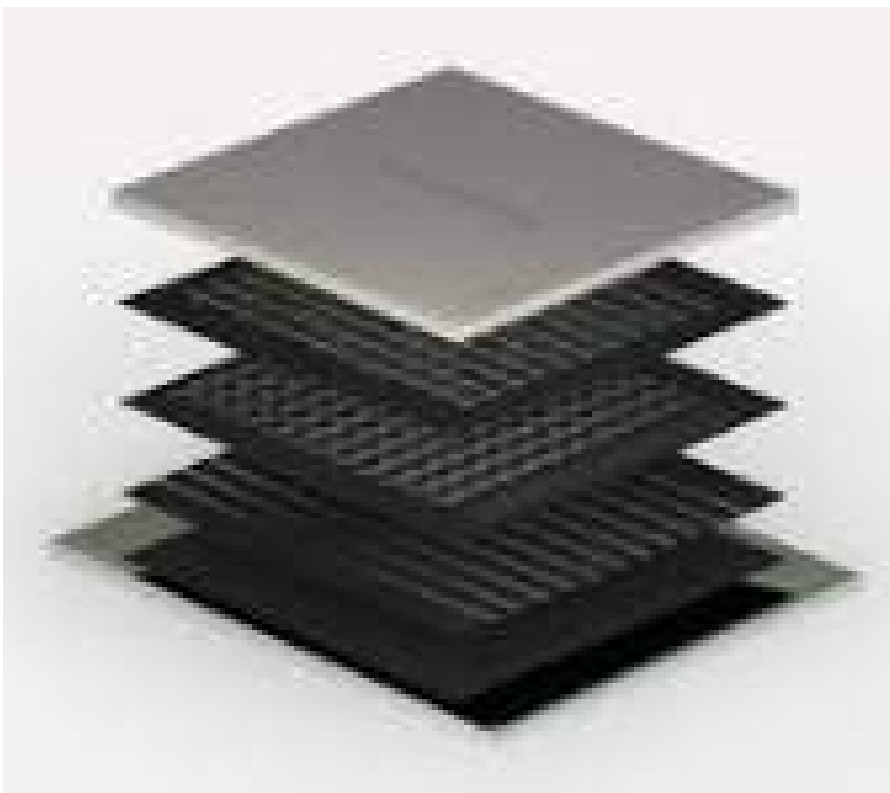
Quantum computers could do better than traditional machines. When physicists Richard Feynman and David Deutsch first proposed quantum computers in the 1980s, their idea was to use them to simulate quantum systems like molecules that cannot be accurately depicted by conventional computers.

Quantum computers are also adept at certain mathematical functions such as factoring integers. It could also conduct faster searches through an unsorted database compared to classical computers. It is also very much used for solving the most challenging problems in chemistry, optimization, machine learning, processing huge amount of weather data and big data analysis.

IBM's quantum computing hardware is comprised of superconducting circuits. The qubits themselves are made of a superconducting material called niobium. IBM announces that to launch 'Osprey', a 433 qubit chip, in 2022, with the 1,121 qubits 'Condor', in 2023 as future quantum computers. IBM has made half of the top 10 fastest quantum processors.

The scale of a quantum chip is measured by its performance of a quantum processor. IBM continues to raise the quality and speed of the processors by benchmarking their Quantum Volume and CLOPS respectively. Circuit Layer Operations Per Second (CLOPS), is a metric correlated with how fast a quantum processor can execute circuits. Using circuit-layer operations per second to gauge processing speed, IBM's current quantum processor measures out at 1,400 CLOPS.

The quantum computer can do GBS 100 trillion times faster than a classical supercomputer. If so then, will quantum computers replace supercomputers?

No, quantum computers will not replace classical computers. Both systems coexist and each will specialize on those tasks they can do better. Sure, you can achieve quantum supremacy, meaning you can do certain tasks way faster on quantum computers than on any classical supercomputers.

Users can access devices for free through the IBM Quantum or Qiskit, and more advanced quantum systems are available to our clients in the IBM Quantum Network (https://www.ibm.com/quantum-computing/ibm-q-network/)

The world's 5 fastest quantum chips by qubits (November 2021)

Name/Designation	Manufacturer	Architecture	Release Date	Qubits
IBM Eagle	IBM	Superconducting	2021	127
Jiuxhang	USTC	Photonics	2020	76
Bristlecone	Google	Superconducting	2018	72
IBM Manhattan	IBM	Superconducting	-	65
Sycamore	Google	Nonlinear superconducting resonator	2019	53

25 TECHNOLOGY TRENDS WILL DEFINE THE NEXT DECADE

FRANCIS INIGO RAJ L

Instructor / INT

The Internet of Things (IoT).

This refers to the ever-growing number of "smart" devices and objects that are connected to the internet. Such devices are constantly gathering and transmitting data, further fueling the growth in Big Data and AI.

Artificial intelligence (AI) and machine learning

The increasing ability of machines to learn and act intelligently will absolutely transform our world. It is also the driving force behind many of the other trends on this list.

Wearables and augmented human

What started with fitness trackers has now exploded into a whole industry of wearable technology designed to improve human performance and help us live healthier, safer, more efficient lives. In the future, we may even see humans merge with technology to create "augmented humans" or "transhumans."

Big Data and augmented analytics

Big Data refers to the exponential growth in the amount of data being created in our world. Thanks to augmented analytics (highly advanced data analytics, often fueled by AI techniques), we can now make sense of and work with enormously complex and varied streams of data.

Intelligent spaces and smart places

Closely linked to the IoT, this trend is seeing physical spaces – like homes, offices, and even whole cities – becoming increasingly connected and smart.

Blockchains and distributed ledgers

This super-secure method of storing, authenticating, and protecting data could revolutionize many aspects of business – particularly when it comes to facilitating trusted transactions.

Cloud and edge computing

Cloud computing – where data is stored on other computers and accessed via the internet – has helped to open up data and analytics to the masses. Edge computing – where data is processed on smart devices (like phones) – will take this to the next level.

Digital platforms

Facebook, Uber, and Airbnb are all household-name examples of digital platforms – networks that facilitate connections and exchanges between people. This trend is turning established business models on their head, leading many traditional businesses to transition to or incorporate a platform-based model.

Digital twins

A digital twin is a digital copy of an actual physical object, product, process, or ecosystem. This innovative technology allows us to try out alterations and adjustments that would be too expensive or risky to try out on the real physical object.

Voice interfaces and chatbots

Alexa, Siri, chatbots – many of us are now quite used to communicate with machines by simply speaking or typing our request. In the future, more and more businesses will choose to interact with their customers via voice interfaces and chatbots.

Digitally extended realities

Encompassing virtual reality, augmented reality, and mixed reality, this trend highlights the move towards creating more immersive digital experiences.

Robots and cobots

Today's robots are more intelligent than ever, learning to respond to their environment and perform tasks without human intervention. In certain industries, the future of work is likely to involve humans working seamlessly with robot colleagues – hence the term "cobot," or "collaborative robot."

Natural language processing

This technology, which allows machines to understand human language, has dramatically changed how humans interact with machines.

Computer vision and facial recognition

Machines can talk, so why shouldn't they "see" as well? This technology allows machines to visually interpret the world around them, with facial recognition being a prime example. Although we will no doubt see greater regulatory control over the use of facial recognition, this technology isn't going anywhere.

5G

The fifth generation of cellular network technology will give us faster, smarter, more stable wireless networking, thereby driving advances in many other trends (e.g., more connected devices and richer streams of data).

Quantum computing

Quantum computers – unimaginably fast computers capable of solving seemingly unsolvable problems – will make our current state-of-the-art technology look like something out of the Stone Age. As yet, work in quantum computing is largely restricted to labs, but we could see the first commercially available quantum computer this decade.

Autonomous vehicles

The 2020s will be the decade in which autonomous vehicles of all kinds – cars, taxis, trucks, and even ships – become truly autonomous and commercially viable.

Drones and unmanned aerial vehicles

These aircraft, which are piloted either remotely or autonomously, have changed the face of military operations. But the impact doesn't stop there – search and rescue missions, firefighting, law enforcement, and transportation will all be transformed by drone technology. Get ready for passenger drones (drone taxis), too!

Mass personalization and micro-moments

Mass-personalization is, as you might expect, the ability to offer highly personalized products or services on a mass scale. Meanwhile, the term "micro-moments" essentially means responding to customer needs at the exact right moment. Both are made possible by technologies like AI, Big Data, and analytics.

Genomics and gene editing

Advances in computing and analytics have driven incredible leaps in our understanding of the human genome. Now, we're progressing to altering the genetic structure of living organisms (for example, "correcting" DNA mutations that can lead to cancer).

Nanotechnology and materials science

Our increasing ability to understand materials and control matter on a tiny scale is giving rise to exciting new materials and products, such as bendable displays.

Machine co-creativity and augmented design

Thanks to AI, machines can do many things – including creating artwork and designs. As a result, we can expect creative and design processes to shift towards greater collaboration with machines.

Cybersecurity and resilience

As businesses face unprecedented new threats, the ability to avoid and mitigate cybersecurity threats will be critical to success over the next decade.

3D and 4D printing and additive manufacturing

Although this may seem low-tech compared to some of the other trends, 3D and 4D printing will have very wide applications – and will be particularly transformative when combined with trends like mass-personalization.

Robotic process automation

This technology is used to automate structured and repetitive business processes, freeing up human workers to concentrate on more complex, value-adding work. This is part of a wider shift towards automation that will impact every industry.

BEAT PLASTIC POLLUTION !!!

RAJA RAJESVARI S
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As the world's population continues to grow, so does the amount of garbage that people produce. The accumulation of plastic products has led to increasing amounts of plastic pollution around the world. "Beat Plastic Pollution", the theme for the World environment day 2018, is a call for all of us to come together to combat one of the great environmental challenges of our time.

" If you can't reuse, refuse it "

TIPS FOR REDUCING PLASTIC WASTE

Shop friendly

Plastic bags were once a modern convenience but can be efficiently replaced by reusable bags many of which fold up compactly in order to be portable. Just think about how many bags you typically carry out of a grocery store, and multiply that by the number of times you shop. That's a lot of plastic! Carry a bag and always reuse plastic bags as much as possible if you have them.

Get Rid of Bottled Water

People are meant to drink lots of water each day, and plastic water bottles have become a great way to stay hydrated throughout the day. However, most of these are only recommended for single-use, and that means, every time someone finishes a bottle it goes into the trash. Many companies now sell reusable water bottles as a substitute, reducing plastic waste and exposure to leaking bottles.

Educate Businesses

Speak to local restaurants and businesses about options that they can switch to for packaging, storing and bagging items. Many companies are starting to come up with excellent low-cost replacements, such as bamboo utensils in place of plastic ones.

Forget-to-go Containers

You would be surprised at how much plastic is involved in the making and packaging of food containers. Think of a coffee shop's drinking cup in the paper? It's likely lined with plastic for insulation (pour a cup of coffee on some cardboard and see what happens). Plastic food containers, lids and utensils are all easily replaced by reusable containers, which will cut down significantly on even a single meal's waste.

Recycle Everything

Try and select items that come in non-plastic recycled and recyclable packaging, to do your best to properly handle items that can't be reused. Check everything before you put it in the trash, as more and more items are able to be recycled these days.

"

TODAY WE USE PLASTIC- A MATERIAL DESIGNED TO LAST FOREVER-FOR PRODUCTS DESIGNED TO LAST A FEW MINUTES.

"

NEW TRENDS IN NETWORKING

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Virtualization enables network architects and managers to design, implement, and manage network services far more efficiently than ever before. Software-defined networking (SDN) and network functions virtualization (NFV) are the key capabilities fostering this evolution. The network architecture in SDN has been divided based on functionality as Data plane, Control plane, and Management plane which is centrally controlled by SDN controller. The Data plane processes and delivers the packets with a local forwarding state. The control plane determines how and where packets are forwarded. Also, it carries out the routing, traffic engineering, and failure detection or recovery of networks.

Configuring and tuning the network, Traffic engineering, ACL configuration, and device provisioning are executed by the Management plane. The SDN controller regulates the whole network. OpenFlow is a communication protocol that enables SDN controllers to determine the path of network packets across a network of switches. It acts as an interface between the control and data plane of an SDN architecture. It has two protocol specifications namely Southbound SDN and NorthBound SDN. Southbound SDN enables the communication between controllers and lower-level components. NorthBound SDN supports the communication between the controller and high-level network components. NFV separates the functionality of proprietary hardware like routers and firewalls and delivers the same functionality using virtual network functions. NFV saves capital expenditures (CAPEX) and operating expenses (OPEX).

Due to its flexibility in customizing network infrastructure, Software-defined Networks have gained importance in redefining the networking structure by automating and hiding the complexity of the underlying network. SDN can create and control traditional network hardware devices or a virtual network by software. In the future, SDN won't replace legacy networks. Instead, it will enhance the working of traditional networks by adding new features. SDN will also enable an easy shift to cloud technology. In the future, the hardware and virtual machines will become a software that runs in the cloud. Networks will be more self-configuring and self-repairing.

Softwarization using Software-Defined Networking (SDN) and Network Function Virtualization (NFV) in 5G networks are expected to fill the void of programmable control and management of network resources with network slicing. The areas which need to be improved are the security threat because of the absence of a firewall and the risk involving the vulnerability of the centralized controller. This software is directly programmable and the devices are managed virtually. SDN controllers centralize network intelligence.

SDN has its technology adapted from OS virtualization devised by VMware which created a virtual program that runs in one system acting as another OS (Windows OS can run in a Linux kernel). SDN and NFV are interdependent, but when employed together achieve flexible, agile network infrastructures. NFV provides the fundamental networking functions and SDN undertakes higher-level management responsibility to orchestrate overall network operations. This architecture is easy to maintain and troubleshoot. It covers a wide area at less cost. There is no need for a new vendor when the network needs an upgrade because it is fully based on a software-based upgrade process.

AUTISM DETECTION INTELLIGENCE AND TRAINING INTERFACE

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Diagnosing Autism Spectrum Disorder (ASD) can be difficult because there is no medical test, like a blood test, to diagnose the disorder. At the same time, there has to be ways in which the diagnosed children get accustomed to the society. The major personality traits like academic, cognitive and societal behaviour can be monitored and models can be rendered based on the given scenarios. Deep fake technology can be used to replicate the person's face who's been given more attention by the student and they are shifted as the face of the teacher who teaches the concepts to a child. These would prove to be very effective in regards to the academic standpoint of the child. A gamified environment can be implemented in terms of developing the cognitive abilities of the child. Each game focuses on a unique trait of generic cognitive abilities essential for intellect. Music is always considered to be a great therapy technique to the autistic child. A recommendation system can be implemented with the help of statistical algorithms which classifies the data according to the user's taste and produces a recommendation that proves to be therapeutically effective in terms of an agitated child. In this way, some of the grave concerns of the problems faced by the autistic child can be further improved and developed.

DETECTION PHASE

Image Processing

The detection of ASD in children is considered to be gravely important as the sooner the disease is detected, the sooner it can be cured. Therefore, as a first step in detecting ASD, an image processing module is implemented which is trained by the thousands of faces of autistic and non-autistic children. Through this process, the model can easily differentiate the same. The dataset for the same is taken from various real-time example websites like Kaggle and Mumsnet for the authenticity of the data being trained. After implementation, the detection of ASD is possible with image processing.

Machine Learning Model

In order to better diagnose the gravity of the situation, the parent of the kid who's suspected of having ASD is asked ten questions through which the diagnosis can be further taken ahead. Those ten questions play a pivotal role in establishing a firm diagnosis in the child's behaviour. The data is then fed into a hybrid machine learning model consisting of 7 algorithms which help in realising the exact diagnosis of the kid. Based on the accuracy rate and curve, the diagnosis can be further moved forward.

Natural Language Processing

The final detection step includes the implementation of an NLP model which will take in inputs from the parent and map the entities present in the sentence and diagnose appropriately. Named Entity Recognition is an extremely advanced process that will involve the concept of mapping entities to a given sentence. The erratic behavioural symptoms of autistic kids can be mapped together and instigate a diagnosis based on the given symptoms.

TRAINING PHASE

Music Module

Scientific studies have proven that children who are suffering from ASD tend to remain calm after hearing to sweet music. This could be really efficient because the agitated state of the child needs to be controlled or else it would lead to some disastrous emotions. So, in order to do that, we use the concept of ML and also utilise the Spotify API to suggest and play songs depending upon the mood of the child.

Gamified Environment

The children who suffer from ASD tend to have great cognitive abilities which will be a great plus point in their lives. In order to further nurture them into developmental skills, we introduce a gamified environment which will enhance the cognitive abilities of the kid. This would really pave way for a better future in the administrative and managerial perspective of the individual.

DeepFake module

The children diagnosed with ASD tend to have a very low attention span. They easily don't get comfortable with a stranger. Even if that particular stranger is their teacher and they need to bond with them. So in order to overcome this situation, deepfake algorithm standard can be used to swap the teacher's face in the lecture videos with the parent's face thereby making the kid more comfortable and attentive. This would help the kid understand the concepts and also pay valuable attention to the class recordings.