

INSIGHT

(MCA Students' Annual Magazine)

Techbyte 2022

Emerging Tech and Digital Transformation





JAGAN INSTITUTE OF MANAGEMENT STUDIES

SECTOR-5, ROHINI

Jagan Institute of Management Studies (JIMS) imparts professional education at post graduate and graduate levels in the fields of Management and Information Technology. The Institute has been working for the attainment of a mission: to develop highly skilled and professional human resource for industry and business for the past 27 years. Established in 1993, it has now acquired a commendable position as one of the premier institutes of the country. Our PGDM, PGDM (IB), PGDM (RM) Programme are approved by the All India Council for Technical Education. PGDM, PGDM (IB) & PGDM (RM) Programmes are accredited from National Board of Accreditation (NBA) for excellence in quality education and have also been granted equivalence to MBA degree by Association of Indian Universities (AIU). Our GGSIP University affiliated programs are MCA, BBA, BCA and BA Eco(H). The MCA programme is accredited by National Board of Accreditation (NBA). The National Assessment and Accreditation council (NAAC) has accredited JIMS at A grade.

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TECHBYTE 2022

18TH Annual IT Symposium

“Emerging Tech and Digital Transformation”

Department of Information Technology

Jagan Institute of Management Studies,
Sector-5 Rohini,
New Delhi-110085

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Editor's Desk

Change is not an outcome of solely rebelling against once what was, but it is brought about by what we need next. As once stated by Socrates, the secret of change is to focus all of your energy not on fighting the old, but on building the new.

In this world of emerging tech and digital transformation, we must be capable of accepting the change brought about. And in order to do so, we must understand the change itself.

We at JIMS believe that our students must not restrict themselves solely to their curriculum. Instead we inculcate a self nurturing habit of growth in them which helps them to transcend beyond the traditional approach to studies. We must explore the ever changing and transforming world that lies before us with all its adventures and challenges.

Techbyte is a magical portal where students step in, to gain INSIGHT into the current and upcoming technologies and keep themselves up to date with industry standards. Through Techbyte, the students are not only polished into industry ready individuals, but they also get a hand in hand experience with event management as they volunteer to help conduct this grand symposium.

We would like to manifest our gratefulness to the management of JIMS and faculty members for their incredible endowment.

The dedicated hard-work and efforts of our students are highly appreciated.

Editorial Team



CHAIRMAN'S MESSAGE

As tech industry continues to shape our future, India is the centre of global attraction and a knowledge hub driving innovation and digital transformation in every sector of the economy. The role of emerging technologies has catalysed digital transformation to accelerate business operational growth, customer engagement and even made our governance more competent and approachable than before. As the onset of pandemic has disrupted financial growth of developed and developing economies, emerging technologies such as Artificial Intelligence (AI), Internet Of Things (IOT), Big Data, robotics, automation, blockchain, virtual reality, augmented reality, and cloud computing have enabled corporate and other sectors to thrive adapting to the 'New Normal'.

In this hyper-competitive world, from healthcare, education, retail, to FMCG, manufacturing, finance, and energy, digital transformation has become the dire need of the hour. For the contemporary organisations, introducing emerging technologies is a strategic imperative, not just an operational issue as it impacts the overall revenue and profitability of the business.

Let's consider the implementation of Artificial intelligence (AI) in transforming the facet of the business. The application of AI-enabled practices such as chatbots, voice-enabled cameras, auto-suggestion based on your browsing history, in-store experiences, try and buy online feature, has provided unprecedented agility, efficient productivity, and real-time results of the business growth.

At JIMS, we take this opportunity to welcome the corporate think-tanks, strategists, academicians, and students to be a part of the Annual IT symposium 'Techbyte 2022'. We take this opportunity as a enriching platform that provides a golden chance to the students to develop nexus with the apex speakers from IT vertical and draw inspiration from their experiences.

I feel fortunate to associate with TechByte event conducted by JIMS Rohini annually and would like to congratulate each stakeholder associated with us in the journey dedicated to embrace newer technologies that adds value by the means of digital disruption.

Manish Gupta



DIRECTOR'S MESSAGE

Technologies such as augmented reality, artificial intelligence, the Internet of Things to name a few are creating disruptions for businesses across the world. Using these technologies, companies are just not able to strategize for present but also for future. Emerging technologies are also used as tools for designing improved business approaches, investment policies and partnerships with customer relationships. Adoption of these technologies has become essential for the survival and success of any business venture in the turbulent environment of today.

Even small and medium enterprises have realized the power of these technologies and are exploring to implement them for driving efficiencies. Last one and half year of the pandemic has also seen an influx of technological application in all types of industries. Technological advancements are happening at a very fast pace which has created a huge demand for skilled manpower. IT companies are hiring in big numbers to fill the current demand. Student should try and harness these opportunities by learning and working on the latest technologies.

Every year our annual IT event Techbyte aims to create a platform for IT professionals and academic experts to discuss the advances in computing Technologies. I hope this year the event sees lot of interaction between students, Industry professional and faculty on contemporary IT technologies.

I wish the entire team of Techbyte 2022 a grand success.

Dr. Pooja Jain



DEAN'S MESSAGE

Evolving technologies every now and then is becoming a vital part of our lives. Today, we see exponential advancements in technologies such as sensors, networks, artificial intelligence, robotics, neural networks and many more. The convergence of these technologies is making amazing things possible. It has brought the revolutions in various fields of modern-day society, be it transportation, education, healthcare, infrastructure, connectivity and many more.

From last 2 years technology is playing a major role in education system. online learning dimension of education is the only one which could connect students and teacher in this hard time. Even before this COVID -19 pandemic there was adoption of education technology but there was a significant blast in the usage of language apps, virtual tutoring, video conferencing and online learning software.

One cannot think of living life without continuous learning. There is always a change in our career, in our personal life, in the organization or even in the society and the most effective way to withstand this change is lifelong learning.

Insight magazine is one of the examples of continuous learning process for the students where students get opportunity to showcase their creative thinking and teamwork as a part of editorial board by writing and compiling this magazine under the guidance of faculty mentors.

This year the magazine focuses on the theme “Emerging Tech and Digital Transformation” where key elements on the technologies such as block chain, Haptic technology, Virtual reality, deep learning, Big data, Fog & Edge computing and Automated reasoning etc. are covered.

I wish TechByte 2022 a great success.

Dr.Praveen Arora

Dean – IPU Affiliated Programmes

CONTENTS

5G <i>Dr. Deepshikha Aggarwal (Professor)</i> <i>Aman Chhabra, Amandeep Singh, Arpita Tanwar, Ashish Sharma, Deep Saxena</i>	07
Amalgamation of Blockchain and IoT Technology <i>Dr. Suman Madan (Associate Professor)</i> <i>Akshit Mahajan, Arbj Khan, Jasmine, Dushyant Aneja, Priya Roy</i>	11
Automatic Number Plate Recognition System <i>Mr. Devesh Lowe (Assistant Professor)</i> <i>Nandita Brahm Bhatt, Khayati Jindal, Rishabh Jain, Manvendra Rawat, Lalima Singh, Swapnil</i>	16
Big Data, Data Searching and Discovery <i>Ms. Aakanksha Chopra (Assistant Professor)</i> <i>Arjun Sharma, Ritik Bhatnagar, Suraj Shaji, Yogesh Dhoundiyal, Yuvansh Kapoor, Sanchit Upadhyay</i>	20
Blockchain Reword <i>Dr. C. Komalavalli (Professor)</i> <i>Sahil Siddiqui, Abhishek Kumar, Abhishek Tiwari, Ankush Joshi, Bhanu Pratap</i>	23
Cloud Concern <i>Dr. Archana B. Saxena (Professor)</i> <i>Himanshu Gola, Avnish Shukla, Deepakshi Verma, Atul Kumar, Anshul</i>	26
Customer Relationship Management Software <i>Ms. Priyanka Gandhi (Assistant Professor)</i> <i>Himanshu Kohli, Hardik Sharma, Md. Aryan, Inder Singh Bisht, Karan Parmar, Sohaib Ahmed</i>	29
Data Driven Decision <i>Mr. Sanjive Saxena (Associate Professor)</i> <i>Divya Kaushik, Harshita Mehta, Prashant Kumar, Mohit Jhankal, Himanshu Sharma, Hemant Dhillon</i>	33
Data Mining Trends, Opportunities and Risks <i>Dr. Deepti Chopra (Professor)</i> <i>Omansh Sharma, Vidya Khanna, Neha Ranjha, Ritik Garg, Karik Goyal, Rahul</i>	37
Deep Learning <i>Dr. Praveen Kumar Gupta (Professor)</i> <i>Deepshika, Dharya, Gajendra, Himanshu, Dinesh</i>	42
Fog and Edge Computing for Cloud Computing <i>Dr. Deepti Sharma (Associate Professor)</i> <i>Kriti Bansal, Divya, Hardik Talwar, Geetanjali Sao, Karan Bir Singh</i>	48
Future of Cryptocurrency <i>Ms. Geeta Sharma (Associate Professor)</i> <i>Shanu Raj, Shweta Sharma, Roma Goyal, Sakshi, Sahil, Sarveshwar</i>	53

Haptic Technology <i>Ms. Ankita Chopra</i> (Assistant Professor) <i>Aastha Gupta, Aditi Raj Shukla, Lakshay Mukhija Kanishk Mongia, Vasu Kwatra, Vishnukant</i>	58
Human Computer Interaction <i>Dr. Latika Kharb</i> (Professor) <i>Jugal Kishor Lohani</i>	61
Virtual Dispersive Network <i>Ms. Bhavna Galhotra</i> (Assistant Professor) <i>Ritwik Gupta, Prakash Chand, Rohit Kumar Singh, Prince Nagar, Nikunj Saxena, Neha Chauhan</i>	64
Virtual Reality <i>Dr. Deepak Chahal</i> (Professor) <i>Shruti Aggarwal, Shubhankar Saxena, Siddhant Sachdeva, Karan Singh Mann, Bhanu Gudheniya</i>	66

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5G

Faculty Mentor: Dr Deepshikha Aggarwal

Student Authors: Aman Chhabra, Amandeep Singh, Arpita Tanwar, Ashish Sharma, Deep Saxena

INTRODUCTION

5G is the fifth era of portable organization. It is the new worldwide remote norm after 1G, 2G, 3G, and 4G organizations. 5G enables another sort of organization that is intended to interface practically everybody and everything together, including machines, items, and gadgets. 5G remote innovation is intended to give more clients access to higher multi-Gbps top information speeds, ultra low dormancy, higher dependability, massive organization limits, expanded accessibility, and a more consistent client experience. Improved and expanded effectiveness in engaging new client encounters and associating new ventures.

5G is driving worldwide development.

- \$13.1 Trillion dollars of worldwide financial yield
- \$22.8 Million new positions made
- \$265B worldwide 5G CAPEX and R&D yearly over the course of the following 15 years

Through a milestone 5G Economy study, we discovered that 5G's full financial impact will probably be acknowledged across the globe by 2035—supporting a wide scope of enterprises and possibly empowering up to \$13.1 trillion worth of labour and products.

This effect is a lot more noteworthy than past network ages. The development requirements of the new 5G organization are also expanding beyond traditional portable systems administration players to enterprises such as the auto industry.

The concentrate additionally uncovered that the 5G worth chain (counting OEMs, administrators, content makers, application engineers, and purchasers) could alone help up to 22.8 million positions, or more than one occupation for each individual in Beijing, China. What's more, there are many arising and new applications that will in any case be characterized later on. The truth will

surface eventually, what the full "5G impact" on the economy will be

ARCHITECTURE

The 5G architecture consists of:

- User plane Function (UPF)
- Data network (DN), example operator services, Internet access or 3rd party services
- Access and Mobility Management Function (AMF)
- Authentication Server Function (AUSF)
- Session Management Function (SMF)
- Network Slice Selection Function (NSSF)
- Network Exposure Function (NEF)
- NF Repository Function (NRF)
- Policy Control function (PCF)
- Unified Data Management (UDM)
- Application Function (AF)

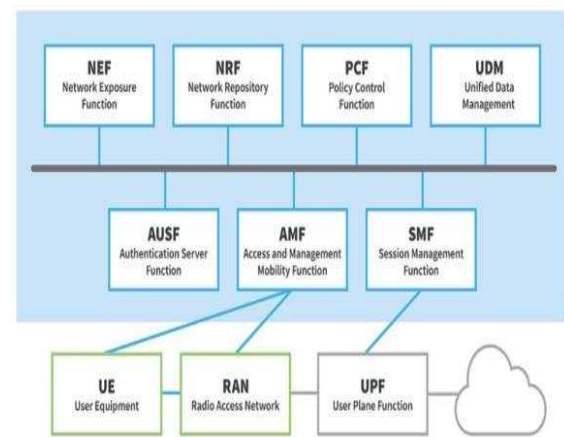


Figure 1: Architecture

- User Equipment for e.g. 5G smartphones connect over the 5G New Radio Access Network to the 5G core and to the **Data Networks**.

- The **Access and Mobility Management Function (AMF)** acts as a single-entry point for the User Equipment.
- Based on the service request, the AMF selects the respective **Session Management Function (SMF)** for managing the user session.
- The **User Plane Function (UPF)** transports the IP traffic between the User Equipment and external networks.
- The **Authentication Server Function (AUSF)** allows the AMF to authenticate the User Equipment and access services of the 5G core.
- Other functions like the **Session Management Function (SMF)**, the **Application Function (AF)**, the **Policy Control Function (PCF)** and the **Unified Data Management (UDM)** function provide the policy control framework, applying policy decisions and accessing subscription information, to control the network behaviour.

APPLICATIONS OF 5G

5G technology will be used in a variety of industries, from retail to education, transportation to entertainment and smart homes to healthcare. It will make the cell phone more important than it is today. What is the use of 5G technology?

Researchers predict a global, social and economic impact of 5G, which will benefit the entire economy and society. It is expected to generate billions of dollars' worth of revenue in the coming years.

1. Mobile network speed

5G will enhance the mobile experience with a wireless network that can support up to 10 to 20 GBPS of data download speeds. It is equivalent to a wireless internet connection. Compared to conventional mobile transfer technology, voice and high-speed data can be simultaneously transferred over 5G. Low latency is one of the most important aspects of 5G technology that is essential for autonomous driving and the delivery of critical applications. 5G networks can be delayed by less than a millisecond. 5G will use new millimetre radio waves to transmit. It has very high bandwidth compared to the low and powerful LTE bands for big data. Mobile downloads will be very fast,

always open, always connected and responsive via mobile internet enabling the mobile experience. 5G networks will enable secure access to cloud storage, access to business plans, and use powerful functions with great processing power. 5G wireless technology will open up more opportunities for new manufacturers and app developers. New VoIP devices and smart devices will be introduced in the market and thus there will be more job opportunities. Wi-Fi hotspots and device communication methods are suggested to further improve network performance and support during limited access or absence of mobile networks. The small cell concept used in 5G will have many benefits for cell availability, higher data transfer, lower power consumption, and a cloud access network.

2. Entertainment and multimedia

According to analysts, in 2015, 55 percent of Internet mobile traffic was used to download videos globally. This trend will increase in video streaming in the future and clearly will become more common in the future. 5G will provide high definition world visibility on your mobile phone. Fast streaming of 4K videos takes a few seconds and can support clear audio clarity. Live events can be broadcast via a high-definition wireless network. HD TV channels can be found on mobile devices without interruption. The entertainment industry will benefit greatly from 5G wireless networks. 5G can provide 120 frames per second, high resolution, and high dynamic video streaming without interruption. The audiovisual experience will be rewritten after the launch of the latest technology powered by 5G wireless. The unpopular reality for taxpayers we see and the virtual reality requires HD video with low latency. The 5G network has enough power to enable AR and VR with an amazing visual experience. Virtual reality games are popular and many companies are investing in VR-based games. 5G network speed can provide a better gaming experience with faster internet.

3. Internet of Things - Connects everything

Internet of Things (IoT) is another area of development using 5G wireless networks. The Internet of Things will connect all objects, devices, sensors, devices and applications to the Internet. IoT applications will collect large amounts of data from millions of devices and sensors. It requires an efficient network of data collection, processing, transfer, control, and real-time analytics. Due to its flexibility, availability of unused spectrum and low cost delivery solutions, 5G is the most efficient candidate for the Internet of Things. IoT can benefit from 5G networks in many areas, such as:

3.1 The Wise Home

Smart home appliances and products are reaching the market today. The Smart Home concept will use 5G networks for device connectivity and monitoring systems. The 5G wireless network will be used with smart devices that can be adjusted and accessible from remote locations. Closed-circuit cameras will provide high quality real-time video for security purposes.

3.2 Management and delivery

The logistics and shipping sectors can use smart 5G technology for tracking, shipping, centralized data management, staff planning, and real-time delivery tracking and reporting. Compared to standard mobile networks (3G / LTE), 5G has a fast network capable of connecting a number of multiple devices at any one time.

3.3 Smart cities

Smart city apps like traffic control, fast weather updates, local distribution, power management, power grid, smart street lighting, water resources management, crowd management, emergency response etc.

3.4 Industrial IoT

Future industries will rely on 5G and LTE wireless technology developed with automated equipment, predictive adjustment, security, tracking process, smart packaging, shipping, asset management, and power management. Smart sensor technology provides unlimited industrial IoT solutions for efficient, safe, cost-effective, and efficient industrial applications.

3.5 Smart farming

5G technology will be used for agriculture and smart farming in the future. Using smart RFID sensors and GPS technology, farmers can track livestock locations and manage them easily. Smart sensors can be used for irrigation control, access control, and power management.

3.6 Fleet Management

Most companies use smart navigation tracking devices. 5G technology will provide the best location tracking and navigation solutions.

3.7 Drone Performance

Drones are gaining popularity for many activities, from entertainment, video capture, medical and emergency access, and smart delivery.

ADVANTAGES of 5G

- Higher Download speeds / faster connection:

5G technology promises much greater speeds. The maximum speed of 4G was approximately 100 megabits per second, but 5th generation technology has the capability to reach about 10 gigabits per second. This was observed in tests that were performed in perfect lab conditions. These higher downloads play a major role when you have a higher amount of data in industrial augmented or virtual reality applications etc. This faster connection speed will be very beneficial because in the future, the use of the cloud is getting intensified day by day and devices having low internal storage capacity will be dependent on the cloud for much larger storage capacity. Fast data transfer is possible with 5G technology. The faster connection speed will also be very useful in high definition video streaming and other cloud services like Google Stadia, etc.

- Low latency (response time):

Latency is the delay that arises between signals. The time a signal takes to reach its destination and trigger a response. 5G technology provides low latency, which will be very good in fields like education, business, and IOT, etc. This thing will allow for numerous technological advancements. Controlling industrial devices, bots, and other devices in the health department will be possible with the low latency provided by 5G technology.

- Hyper-connectivity.

The 5G network ensures the possibility of having an interconnected environment to reach the point of having the much desired "smart cities" and "smart devices." The correct performance of these new dynamics will depend on the bandwidth and low latency of 5G.

- Easily manageable with previous generations

As it is impossible for everyone to adapt to the new technology. 5G technology has this superiority to get managed with previous generation technology. And slowly, with time, 5G technology will be adapted by almost everyone.

- 5G will facilitate advances in Automation and IOT.

Improved machine-to-machine (M2M) communication for automation (e.g., wirelessly connected manufacturing robots). The vision for 5G is that it could support an IoT that isn't just collecting data and sending alerts but automating actions in response to that data.

- More security than previous generations.

5G technology had some anti-tracking and spoofing features making it harder for hackers on a network to track and manipulate individual device connections. 5G technology encrypts more data, so less is flying around in the clear for hackers to intercept. 5G is a software and cloud-based system than previous wireless networks, which allows better monitoring to spot potential threats.

DISADVANTAGES

- Need new devices

People will have to buy new devices that supports 5G technology to enjoy high speeds provided by 5G.

- Chances of health issues

According to some reports, 5G will have an impact on the health of humans as well as animals. There

is no surety of health issues, as the research is still in progress.

- More transmission devices required

5g technology uses millimetre waves, Which are shorter than the wavelength of 4G, resulting in a shorter range than the 4th generation, so more transmission devices will be required to provide the best coverage.

- Loophole in security

As 5G is still under development phase engineers need time to fix security, privacy issue and other bugs to be resolved in this new technology.

CONCLUSION

This article provides an overview of 5G technology. It would be a part of one of the most significant technological revolutions in human history, one with limitless applications. Not only can it change people's lives, but it also has the potential to save them through improved emergency care and reducing traffic accidents. Before the commercialization of 5G technology, it is essential to continue to develop network capability and flexibility in order to cope with a variety of use cases and business models. It's also important to keep an eye on 5G technology's energy and cost efficiency. It has a bright future and could be a revolution in the cellular market.

"Technology is best when it brings people together."

AMALGAMATION OF BLOCKCHAIN AND IoT TECHNOLOGY

Faculty Mentor: Dr. Suman Madan

Students Authors: Akshit Mahajan , Arbaj Khan,Jasmine, Dushyant Aneja, Priya Roy

INTRODUCTION

Everything around us is getting smarter every day, and two of the most fascinating and trending techniques that increase the quality of life that protect our privacy and security are blockchain and Internet of Things. The constant expansion of the Internet of Things (IoT) is creating immense opportunities for everyone, especially in developing countries. Automobiles, defence, agriculture, healthcare, tourism, hospitality, and education have changed with the rise of artificial intelligence information systems.

In 2009, Satoshi Nakamoto, the inventor of the Blockchain created the first Bitcoin transaction. A "blockchain" is a digital record that divides data into blocks, each of which includes a set of information. Blocks have specific storage capacity, and when filled, they are linked onto the preceding block, producing a data chain.

If Blockchain helps to make IoT more secure, it's because when it integrates with IoT, it solves problems like data leaks and privacy disruptions, primarily by allowing for easy management of the presence of each individual user or group, as well as by storing data in Blockchain itself, which eliminates the risk of any privacy or security threats.

The Internet of Things (IoT) has brought a digital revolution in almost every aspect of our lives. Privacy and security issues have emerged as major challenges to its spreading wings even further. Crypto Cryptology is a viable solution for IoT privacy and security problems.

Huckle et al. discussed the benefits of IoT and Blockchain technology in shared economy applications, with the main focus of their work being

to create decentralised, secure, and transparent shared economy distributed applications based on Blockchain technology, among those researchers

who have discussed the applications of Blockchains in the vast area of Internet of things (IoT). The concept of smart cities, smart homes, and smart gadgets is a driving force behind the development of more IoT devices. These devices have their own limitations in terms of computational power, storage, and network capacity. Dorri et al. (2017) proposed a lightweight Blockchain-based design for IoT. A group of researchers presented an overview of typical security concerns associated with Software Defined Networking (SDN) and IoT clouds, as well as the design principles of Blockchain technology, and proposed Blockchain as a solution to SDN and IoT security issues (Tselios et al., 2017).

Premkumar and Srimathi evaluated the applications of Blockchain with IoT in the healthcare sector, where the authors addressed numerous problems encountered with open concerns in smart healthcare arising owing to related security measures in a survey article (Tariq et al. 2020).

WHAT IS BLOCKCHAIN TECHNOLOGY?

Blockchain technology has garnered significant attention since its preamble alongside Bitcoin. In several ways, blockchain technology has transcended cryptocurrencies. Now, it is getting used for important cryptocurrency operations, with multiple groups seeking to use it for other kinds of peer-to-peer value transfers.

Types of Blockchain

Blockchains are distinguished into two groups: Permission seeking or Permission less Blockchain, as defined below:

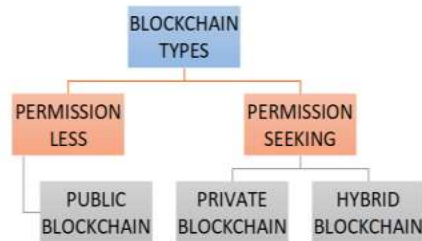


Fig 1: Types of Blockchain

A) Permission Seeking Blockchain : A consent-seeking Blockchain requires the consent so as to operate it or have access to it. Known to forestall data loss and also maintain secludedness, consent seeking Blockchains are else classified into private and cross Blockchains.

Private Blockchain : Private Blockchains are looking to make chains where minor centrals are restricted in number and IDs of each epicentre is known. Hyperledger and R3 Corda are exemplifications of a private, non-centralised, version of the Bitcoin.

Hybrid Blockchain: Hybrid Blockchains aim at delivering clarity, feasibility, and elasticity. Dragon chain is a cross-blockchain that has features both of open and idiomatic versions of the Blockchain.

B) Permission Less Blockchain

A Public Blockchain is a kind of allowance-less Blockchain that licenses free and unlimited investment of all belongings. It allows anyone to partake in a deal in the business of an addict, miner, or community member. Two popular known public Blockchains are Bitcoin and Ethereum.

The Structure of Blockchain

The blockchain is the arrangement of blocks and the data is written under square blocks. Each square block contains the information related to past blocks which includes various hubs to prevent information from destroying.

Blockchain also have some attributes: -

1. **Block Size-** It is the blockchain's initial and most important feature, since it contains the blockchain's structure and also refers to the size of the blockchain, which is represented using 4-byte data and has a maximum capacity of 4000 transactions.
2. **Block Header-** It consists of 3 fields, which identifies a blockchain. The first is used to connect prior transactions to the blockchain. Timestamp is in the second field, and the summary of all transactions is in the third field.
3. **Size Exchange-** Size exchange provides the platform for transactions and size exchange is the number of exchanges allowed for blockchain.
4. **A Miner Network-** It's a technique which is capable of adding new transactions to blockchain's ledger to represent the overall number of miners in a blockchain network.

Advantages and disadvantages of Blockchain



Fig 2: Advantages of Blockchain

The main advantages of blockchain are: -

1. **Transparency** - because of distributed ledger and all the nodes share the copy of documents with each other.
2. **Security-** the transactions of the shared documents can be updated and modified on the blockchain network.
3. **Blockchain doesn't involve middleman and third parties** to save the business costs.

The major disadvantages of blockchain are:

1. Slow Process and immutable data
2. Non-Distributed Computer system
3. Blockchain Consume Too Much Energy

WHAT IS INTERNET OF THINGS (IoT)?

As we are aware, the 21st century has a large number of IoT gadgets and millions of data being moved among the various machines for processing the data.

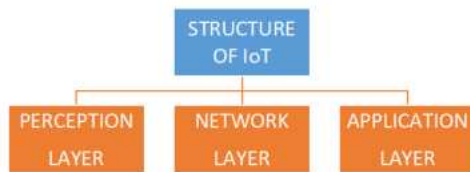


Fig 3: The Structure of IoT

IOT devices are made of different types of layers :-

1. **Perception Layer:** this layer Responsible for sensing the environment and sending the collected data to the network layer.
2. **Network Layer:** connect with other similar types of sensors, for collecting and transmitting sensor data.
3. **Application Layer:** provide application-specific service to the end user like smart home, smart health, and smart city.

INTEGRATION OF BLOCKCHAIN TECHNOLOGY AND IOT

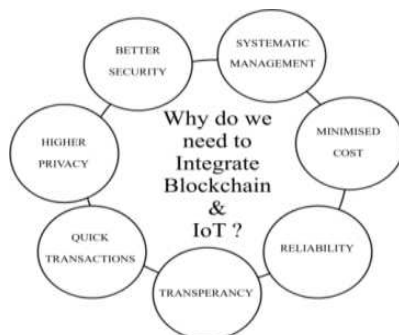


Fig 4: Benefits of integration of IoT and Blockchain

The integration of Blockchain Technology and IOT has many benefits like:

- (a)Transparency:- This provides the user a transparent and a direct link.
- (b)Ease of finance:- With the interlinking of IoT and Blockchain, the financial transfers become faster.
- (c)Privacy:-with the blend of digitalization with automation, the number of threats reduces.

APPLICATION AREA OF BLOCKCHAINS IN IOT

IoT is utilized in different spaces like medical services, home applications, agribusiness, transport, electrical instrumentation, cataclysmic events, town contamination, water quality and modern transportation.

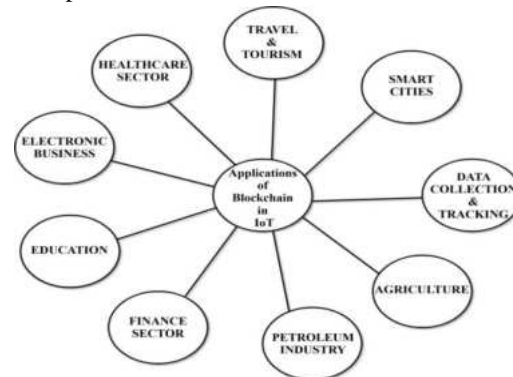


Fig5: Applications of Blockchain in IoT

1. Agriculture Sector: The GDP of our country or monetary improvement of our nation is concerned, and the Agriculture area is a significant piece of it. Remote checking of harvests should be possible with assistance of robots. Sensors like light, and temperature can be set in the fields for observing the dirt quality and climate.

2. Education Sector

Electronic Learning Contract (ELC) can address a ceaselessly working comprehension to review student progress. In the chain of informational squares, graduates under study have affirmation. While coordination of IoT in the training area carries many benefits to understudies and schools like customized learning.

3. *Smart Homes And Smart Cities*

The system of a green city relies on the mix of the Internet of Things and distributed processing development, with the help of IoT to improve the energy utilisation of houses and fueling suppliers to regulate all of the assets. With the introduction of IoT, it is now possible to work on green metropolitan regions, efficiently resolving concerns such as local street traffic, climate contamination, and water supply.

4. *Healthcare System*

Wearable IoT applications aid in the real-time collection of data amongst different devices in the healthcare system. The medical sector has experienced a significant boost after the introduction of the Blockchain technology. The combination of the two technologies, as well as the implications for medical services, could help.

5. *E-Business*

E-business models make use of IoT methods to boost revenue via DAC. Decentralized Autonomous Corporations (DAC) are created to eliminate the presence of humans and, as a result, the problem of falling prey to human manipulations. Devices that use DAC must be connected to the Blockchain and the Internet of Things.

6. *Data Collection And Tracking*

Freight trucks, delivery trucks, and warehouses all have IoT devices. They assist the user in locating and tracking the item's present location as well as other aspects. Sensors can also be used to keep track of moisture, temperature, and other item properties.

7. *Finance*

Blockchain is an open-source technology that allows anyone to construct monetary apps for free. In Finance, IoT could help

with self-checkout, smart engagement, connection between financial devices, and customizable client service. The more frequently IT assists clients with cash management via smartphones, the more this technology will be used.

8. *Tourism And Hospitality*

The e-travel industry makes substantial use of computerised installations through applications that are supported by a wide range of installation doors. IoT technology is used to solve overbooking, a major issue in the tourism business during peak season. Security has become a major priority for IoT developers and an often requested feature.

SECURITY & PRIVACY ISSUES

Users frequently complain about security and privacy concerns, which are the most significant drawbacks of combining Blockchains and IoT. These concerns have been rectified to some extent thanks to continuing work and study.

1. *Threats*

i. Accessibility threats: a client faces problems under this threat when the client tries to access the Blockchain or a single block.

ii. Authentication threats: the most typical authentication and access management threats in a Blockchain allow a hacker to learn the user's login, password, or access credentials.

iii. Confidentiality threats: In this, the attacker obtains user's confidential information through a variety of ways, resulting in the invasion and the public disclosure of even the most sensitive information about the user.

iv. Integrity threats: this threat jeopardises the reliability of a network, making it critical to protect data integrity because once data is destroyed, it cannot be retrieved.

2. Attacks

i. Denial of Service Attack (DOS): In this attack, the perpetrator sends an excessive number of transactions to the target in order to suffocate its operation and, as a result, disrupt users' convenience.

ii. Modification Attack: In this, the attacker could request that stored information for a specific user be changed or deleted.

iii. Dropping Attack: To launch attack, the attacker must first get control of a CH (Cluster Head), after which he or she can drop all incoming blocks and transactions.

iv. Appending Attack: The opponent must handle many CH (Cluster Heads) that use the hand and glove to launch this attack.

3. Private Key Security

The character security qualification is a client's private key, which is developed and maintained by the client rather than other organisations or third parties. It's very hard to go back once a user's personal information has become public or has been exposed. It's impossible to track user behaviour because the user is anonymous.

4. Updation Issues

Fork difficulties are divided into two categories: hard fork and soft fork. When the system is updated or gets a new version, the older nodes aren't ready to change with the newer nodes, which causes hard fork problems. As a result, numerous Blockchains are formed.

LIMITATIONS

To resist achievable DDoS (Distributed Denial-of-Service) assaults, the capacity of a block was initially set to one MB. With the introduction of 5G technologies, IoT devices will need to be upgraded to work with high-speed networks.

CONCLUSION AND FUTURE SCOPE

Blockchain and the Internet of Things are still in their infancy. The combination of these two technologies aims to offer systems that are more secure, dependable, transparent, and efficient while also being less expensive. Combining these two methods could bring crypto currency up to par with conventional fiduciary money. It will improve the speed and effectiveness of execution while also reducing transaction time. We need to learn more about the technologies mentioned above in order to transition from the Internet of Things to the Internet of Everything.

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AUTOMATIC NUMBER PLATE RECOGNITION SYSTEM

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INTRODUCTION

The Programmed Number Plate Affirmation (ANPR) was created in 1976 by the Police Logical Advancement Branch in the UK. Regardless, it has attracted a great deal of interest during the last decade, alongside the improvement of cutting-edge cameras and the augmentation of computational breaking points. It is essentially the ability to normally focus and affirm the characters of a vehicle number plate's characters from an image. Fundamentally, it contains a camera or edge grabber that has the ability to get an image, find the space of the number in the image, and thereafter remove the characters for character affirmation mechanical assembly to make an understanding of the pixels into a numerically understandable individual.

ANPR can be used in a variety of settings, ranging from speed enforcement and instrument placement to parking structure managers, among others. It is a mass perception strategy that uses optical individual affirmation on pictures to scrutinize the labels on vehicles. They can use existing shut down circuit TV or road rule execution cameras, or ones expressly planned for the endeavor. They are used by various police powers as a methodology for electronic expense combination on pay-per-use roads and to notice traffic development, similar to red light adherence at an intersection point. ANPR can be used to store the photos acquired by the cameras similarly to the text from the tag, with some configurable to store a photograph of the driver. Structures by and large use infrared lighting to allow the camera to snap the photograph whenever. An inconceivable flicker is associated with no less than one variation of the crossing point checking cameras, serving both to illuminate the picture and to make the liable party aware of their mistake. ANPR advancement will overall be region-express, inferable from plate assortment, starting with one spot then moving onto the next.

History of Automatic Number Plate

Recognition System

- ANPR was designed in 1976 in the UK at the police logical improvement branch (PSDB), now named as the work space logical advancement branch, and was created in 1979.
- Early preliminary framework was sent in the UK on A1 street at Dartford Burrow, crossing the M25 motorway, and captured and credited ANPR identification of the taken vehicle.
- In 1993, ANPR was first and foremost sent for as a feature of "RING OF STEEL" in London. The task was the biggest activity of its sort at any point in time seen and executed by the London police.
- In 1997, the Police National ANPR Data Center (NADC) was formed as an expansion to the police public PC administration.
- In 2003, London's clog charge plot was acquainted, which focused on decreasing traffic since it covered 20 sq km and had 700 ANPR cameras prepared on each street in and out charging point .
- In 2005, the first advancement in the formation of eye TRAFFIC administrative center stage, which is intended to deal with ANPR with various kinds of organizations.
- ANPR Worldwide delivered the first static camera framework for leaving the board cover, GAURDIAN, in 2006, which is the first module work to vehicle leave screen to screen the vehicles in the leaving, compute in and out measures of time, and consequently distinguish whether the vehicles are approved or not.
- In 2007, the module reached out with incorporation of charge leaving hardware, which implies the framework is completely coordinated with the scope of pay and show meter to permit the administrative center

framework to recognise whether a vehicle has paid leaving charges or not.

- In 2009, it fostered a versatile ANPR item which planned various applications, including traffic overviews, portable observation, and untaxed vehicles (driving permit).
- In 2011, they created and sent out vehicles for short slicing to stay away from blockage. The framework was conveyed to the country's chamber and acknowledged by the police, who issued a fixed punishment notice to the wrongdoer.
- In 2012, the first vehicle Damage Recording System (DRS) was created to record vehicles' conditions showing up at air terminal valet leaving to forestall fake protection guarantee for vehicle harm against air terminal staff.
- In 2013, ANPR won a grant for a versatile traffic overview to be used to gather information on traffic profiles and stopping propensities .
- In 2014, they were created to resolve an issue with speed in broad daylight transport exchanges.
- In 2016, DRS stretched out to double path catch, taking into account numerous paths and 14 cameras incorporated with ANPR information and vehicle pre-booking programming to accelerate client experience.
- In 2017, the framework will inhabit the UK air terminal to address a significant degree of episodes with vehicles. Attempt to keep away from installments by leaving premium pickup and drop-off zones.
- In 2018, advanced cameras were dispatched.

How ANPR works?

ANPR is one of the most reliable utilizations of PC vision frameworks. Frameworks for robotized number plate acknowledgment utilize optical person acknowledgment (OCR) to peruse vehicle enlistment plates. Cameras catch fast pictures of number plates, and programming for picture preparing is utilized to identify characters, check the grouping of those characters, and convert the number plate picture to a message.

- A typical ANPR framework includes a computerised image capture unit (camera), a preparing unit, and various video examination calculations. Furthermore, the use of infrared lighting enables such frameworks to catch vehicle enlistment

plates around evening time, allowing ANPR to work throughout the day.

- Firstly, the ANPR camera catches pictures that contain a tag (video transfer or photograph).
- Then, the plate is recognized utilizing AI and PC vision measures (Object Detection).
- Finally, OCR programming is applied to the distinguished plate region to return the tag number in text design. The changed over number is typically put away in a data set for joining with other IT frameworks.

ANPR utilises optical person acknowledgment (OCR) on pictures taken by cameras. When Dutch vehicle enrollment plates changed to an alternate style in 2002, one of the progressions made was to the textual style, presenting little holes in certain letters (like P and R) to make them more recognisable and, hence, more readable in such frameworks. Some tag courses of action use varieties in text dimensions and situating—ANPR frameworks should have the option to adapt to such contrasts to be genuinely powerful. More convoluted frameworks can adapt to worldwide variations, but many projects are independently custom-fit to every country. The cameras utilised can be existing street rule authorizations or shut-circuit TV cameras, just like portable units that are normally appended to vehicles. A few frameworks utilise infrared cameras to take a more clear picture of the plates.

During the 1990s, critical advances in innovation took programmed number-plate acknowledgment (ANPR) frameworks from restricted, costly, difficult to set up, fixed-based applications to basic, "simple to use" versatile ones. This was made conceivable by the production of programming that ran on less expensive PC-based, non-expert equipment that, additionally, presently does not have the pre-characterized points, heading, size, and speed at which the plates would be passing through the camera's field of view. Further downsized parts at more savvy prices direct drive toward a record number of organisations by law enforcement offices all over the world. More modest cameras with the capacity to peruse tags at higher velocities, alongside more modest, more tough processors that fit in the trunks of police vehicles, permitted policemen to watch day by day with the advantage of tag perusing continuously, when they can prohibit right away.

Regardless of their viability, there are vital difficulties related to portable ANPRs. One of

the greatest is that the processor and the cameras should work adequately quickly to oblige relative rates of in excess of 100 mph (160 km/h), a probable situation on account of approaching traffic. This hardware should likewise be exceptionally productive since the force source is the vehicle battery, and gear should be small to limit the space it requires. Relative speed is just one issue that influences the camera's capacity to really peruse a tag. Calculations should have the option to make up for every one of the factors that can influence the ANPR's capacity to create an exact read, like season of day, climate, and points between the cameras and the tags. A framework's light frequencies can also straightforwardly affect the goal and exactness of a read in these conditions.

Introducing ANPR cameras on legal authority in vehicles necessitates careful consideration of the cameras' proximity to the tags they will be scanning. Utilizing the right number of cameras and situating them precisely for ideal outcomes can demonstrate testing given the different missions and conditions close by. Interstate Watch needs forward-looking cameras that range along various paths and can peruse tags at exceptionally high rates. City watch needs more limited reach and lower central length cameras for catching plates on left-hand vehicles. Parking areas with oppositely parked vehicles regularly require a particular camera with an extremely short central length. Most advanced frameworks are adaptable and can be configured with a variety of cameras ranging from one to four, which can be easily repositioned on a case-by-case basis. States with back-just tags have an extra test since a forward-looking camera is insufficient with approaching traffic. In this situation, one camera might be turned in reverse. 2nd, 3rd, and 4th stages: The tag is standardized for brilliance and differentiation, and afterward, the characters are divided to be prepared for OCR. There are seven essential calculations that the product needs to distinguish a tag:

- Plate limitation – is in charge of locating and disconnecting the plate on the image.
- .Plate direction and measuring: this makes up for the slant of the plate and changes the measurements to the necessary size.
- .Normalization – changes the brilliance and differentiation of the picture
- Character division—finds the unique characters on the plates.
- Optical person acknowledgment

- Syntactical/Geometrical examination – check characters and positions against country-explicit standards.
- The averaging of the perceived worth over different fields/pictures delivers a more solid or sure outcome, particularly given that any single picture might contain a mirrored light flare, be to some degree darkened, or have other muddling impacts.

The intricacy of every one of these subsections of the programme decides the exactness of the framework. During the third stage (standardization), a few frameworks use edge recognition methods to build the image contrast between the letters and the plate backing. A middle channel may likewise be utilized to decrease the visual clamor on the picture. There are various potential challenges that the product should have the option to adapt to. These include:

- Poor document goal, as a rule in light of the fact that the plate is excessively far away yet now and again coming about because of the utilization of an inferior quality camera
- Blurry pictures, especially movement obscure
- Poor lighting and low differentiation because of overexposure, reflections or shadows
- An object darkening (part of) the plate, normally a tow bar, or soil on the plate
- Read tags that are distinctive at the front and the back in light of towed trailers, campers, and so forth.
- Vehicle path change in the camera's point of view during tag perusing
- A diverse text style, well known for vanity plates (a few nations don't permit such plates, taking out the issue),
- Circumvention methods
- Lack of coordination between nations or states. Two vehicles from various nations or states can have a similar number yet unique plan of the plate.

While a portion of these issues can be remedied inside the product, it is basically passed on to the equipment side of the framework to work out answers for these troubles. Expanding the stature of the camera might stay away from issues with objects (like different vehicles) darkening the plate yet presents and increments different issues, for example, adapting to the expanded slant of the plate.

On certain vehicles, tow bars might obscure a couple of characters of the tag. Bicycles on bicycle racks can likewise darken the number plate, but in certain nations and wards, like Victoria, Australia, "bicycle plates" should be fitted. Some limited scale frameworks take into account a few blunders in the tag. When utilized for giving explicit vehicles admittance to a blockaded region, the choice might be made to have an adequate blunder pace of one person. This is on the grounds that the probability of an unapproved vehicle having a particularly comparative tag is viewed as minuscule. Notwithstanding, this degree of incorrectness would not be adequate in many uses of an ANPR framework.

Indian Perspective

ANPR in nations like Vietnam, Australia, and Italy, which have genuinely normalized tags, has precision levels frequently surpassing 90%. India, notwithstanding, is very unique. In India, there are 210 million vehicles with more than 50 distinctive tag types. The plates shift in style, shading, textual styles, estimates, and even area in the vehicle. Besides, cameras sent to India in general will be of lower quality, in this way intensifying the capacity for ANPR motors to precisely disentangle the tag. The minimal expense cameras have restricted visual inclusion, are outfitted with less intense movement and item discovery sensors, and have restricted night vision abilities. These three elements increase the number of vulnerable sides and the occurrence of foggy images. The present circumstance is exacerbated during the evening and in nasty climates when perceivability is lower. Accordingly, ANPR for India is especially troublesome, and precision rates only occasionally surpass 70% from our inside examination of our serious ANPR suppliers. EFKON India is one of the nation's leading suppliers of ANPR, which is an Automatic Number Plate Recognition System. In India, ANPR has been introduced in places by EFKON like Yamuna Express Way, Greater Noida Expressway, Aligarh Smart City Limited, Tumakuru Smart City Limited, Varanasi Smart City Limited, NHAI and a lot more places. Steps to develop India's ANPR:

One of the most important techniques is to fix issues with camera position and width of concentrate so the tag can be more present. A few customers share pictures where the headlights make it difficult to try

and discern that a plate is available. To fix this, you'll need to light up entrance/leave focuses or utilize a camera with a higher opening. As India goes through a period of modernization and framework improvement in the forthcoming decade, we see huge freedoms for the different government elements, districts, and organizations to accept ANPR.

Conclusion

This is an automatic number plate recognition method in which the vehicle plate image is obtained by the digital cameras and the image is processed to get the number plate information and hence make it easier to maintain a database and provide ultimate security. A rear image of a vehicle is captured and processed using various algorithms. Furthermore, one can observe the characteristics involved with the automatic number plate system for better performance. Hence, we can conclude that ANPR solutions tend to gain huge popularity today. Starting from enforcement to providing smoother day-to-day facilities, it has served all. However, technology is evolving, and you will see many advances in the near future!

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BIG DATA, DATA SERCHING AND DISCOVERY

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INTRODUCTION

Big data is a large data collection by capacity, but it grows over time. Data is so vast and sophisticated that no traditional data management tools can store or process it properly. Big data is also data but with a bigger size. It is a blend of structured, semi structured and unstructured data collected by organizations that can be mapped and used in machine learning projects, forecasting models, and other advanced analytics applications.

Systems that operate and store large amounts of data have become commonplace for data management systems in organizations, including tools that support the use of large amounts of data. Big data is usually seen in three Vs:

- large volume of data in many places;
- various types of data that are constantly stored on large data systems;
- the speed at which most of the data is produced, collected and processed.

Although big data does not match any particular volume of data, big data transmissions usually include terabytes, petabytes, and Exabytes of data created, and collected over time. Companies use big data in their systems to improve performance, provide better customer service, create customized marketing campaigns and perform other actions that, ultimately, can increase revenue and profit.

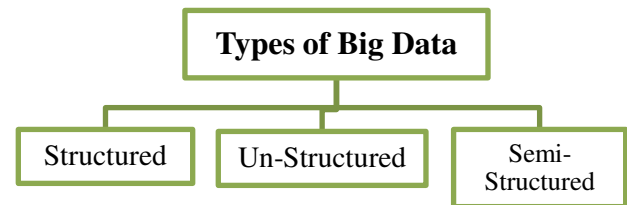


Fig 1: Types of Big Data

Structured: A Data that can be stored, accessed in fixed format is called 'structured' data.

Unstructured: Data with an unknown structure is classified as unstructured data. Also its big length, random records creates many demanding situations in phrases of its processing.

Semi-structured: This form of data can incorporate both forms of data.

Characteristics of Big Data

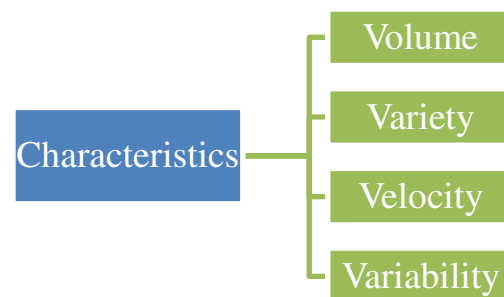


Fig 2: Characteristics of Big Data

Volume - The phrase Big Data itself is related to a very huge size. Data size plays a very important role in figuring out the quantity of records' output.

Variety- The next facet of big data is its multiplicity. Variety refers to different sources and types of data, both structured and unstructured

Velocity - The term 'velocity' refers to the speed of data production. Data generated and processed quickly to meet needs, determines the actual power of data.

Variability - This means inconsistencies that data can sometimes show, thus disrupting the process of managing and managing data effectively.

Why Is Big Data Important?

The prominence of big data doesn't revolve around how much data you have, but what you do with it. You can extract records from any source and analyze them to find answers that enable cost reductions, time reductions and smart decision making. When you merge big data with powerful statistics, you can achieve business-related tasks such as:

- Determining the causes of failure, issues and disabilities in the near future.
- Making coupons on sale, based on customer buying practices.
- Renewal of risk portfolios in minutes.
- Getting fraudulent work before it affects your organization.

Advantages Of Big Data Processing

The ability to process Big Data in DBMS brings many benefits, such as Businesses being able to use outside intelligence whilst making decisions .

- The availability of social media from serps and sites like Facebook and twitter empowers agencies to refine their enterprise strategies.
- Improved client service Traditional consumer reaction schemes are being changed with the aid of new structures designed with Big Data technology. In those new structures, Big Data and local language processing technology are used to study and compare client responses.

- Timely identity of dangers to the product / services, if any

Big Data Searching

As discussed above, big data is a collection of data on a large scale, as each and every company is generating heavy data every second. It contains extremely large datasets that need to be analyzed for further knowledge processing. Thus, having this much data, it is necessary to search for data among such a large dataset. Apart from large dataset, data is present on various sources, i.e., internet, social media, data warehouse, enterprise database etc. Big data searching requires a special system through which user can search data, there are various open source tools to search through big data to analyze it.

Searching of data is not only done on structured data, it may also include searching for unstructured data. A user may need to run various Queries at the same time, it also includes searching at real time.

Various tools for Big Data Searching that is being commonly used by most of the users include:

1. **Lucene:** Being an open source tool provided by Apache, this tool helps us with searching, indexing and also spell checking. Lucene is a big data searching tool and is used in various libraries for searching, which include Lucene Core library and also PyLucene which is a python based library. Lucene core is Java based library which includes searching, indexing and even spell checking. PyLucene is a python library used for providing sub bindings to Lucene Core. Lucene Uses various searching algorithms which includes ranked searching, field searching, data range searching and multiple index searching.
Apache Solr: It is another open source searching tool used for big data searches. It is based on Lucene core as well, which is served by apache itself. Solr is used for tolerating high amount of data and traffic. It is one of the most reliable and scalable software used for searching. It uses various features like load balancing, distributed indexing and replication. Solr uses load

balancing queries for searching and it also provides an automated failover and recovery system. This tool is basically used to manage data on websites. Solr provides a full text search feature to its user. It uses Dynamic Clustering, faceted search, geospatial search and near real time indexing.

Elastic Search: This tool is used for web searching and big data analysis, it is also based on Lucene core and uses Lucene for low-level indexing and analysis. It is widely used due to its developer friendly nature and because of built in REST API, It provides real time analytics and ease for data indexing. One of the most highlighted features of Elastic Search is that it provides full text search. Elastic Search also uses resilient clustering which helps in detecting failed or new nodes, resilient clustering also includes reorganizing and rebalancing of data automatically, this helps in keeping data safe and secure. Elastic Search is known as schema less, which provides searching through multiple indices which are sub-divided into shards and these are distributed.

Big Data Discovery

It is a logical combination of the three hottest methods of the last few years in analytics: Big Data, Data Discovery, and Science Data.

Each of these areas has seen volatile growth, but there is a clear decline with each decline. For example, Desco Discovery is relatively easy to use, but only allows for a limited amount of testing, while Data Science provides powerful but slow, complex, and difficult to use analysis.

With the incapability of the three-keen technology map to the benefit of others, it is now beginning to come together, and Gartner believes Big Data

Discovery will be a different new market segment in 2017.

The emerging Big Data Discovery tools will be easier to use than data science products and will be available to a wide range of users, with the powerful cunning of various data sources.

Top 3 benefits of data discovery

1. A complete picture of company details

Data discovery gives businesses a larger view of the image of multiple data streams in their organizations, allowing them to integrate these streams into their analysis and develop solutions around their challenges or customer needs. For example, a retail bank can integrate customer data into its website, mobile app, social media and ATMs to get a more accurate view of each person they work for and better understand their behavior.

2. Data discovery increases the chances of profit-driven competition

Most leading businesses understand that in order to compete in the 2020s, they must take an aggressive data-driven approach to understand the environment in which they operate and to manage their business at measured performance standards. The oldest saying in computer technology is that when input is incorrect, the system will produce a negative result of "garbage in, garbage out"

(" GIGO "). the problem comes and they put in place appropriate procedures and strategies to reduce it.

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BLOCKCHAIN REWORD

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INTRODUCTION

A world with a system to trust, to rely upon. Isn't this the utopian world that we all desire to have? Breaking the gates would be so nearly impossible that nobody would wish to break them.

A world where relief organizations are able to receive funds instantly from every individual donor and then they can distribute these funds effectively and efficiently to the people in need who can prove their identities without any piece of paper or any hassles. We can see any hard working parent in any country can send payments to their respective families back without any of them needing a bank account, a customer can track the origin of their food, voter fraud is an unheard folklore and every citizen has faith in the democratic process and people can prove exactly what property they own. Well we are not there yet, but an emerging technology called blockchain is already helping us reimagine the world in ways that can only be seen in science-fiction.

Two researchers, Stuart Haber and W.Scott wanted a system which is timestamped and which cannot be modified, in their respective researches they introduced the concept of blockchain. However, it came into existence with an anonymous programmer, Satoshi Nakamoto's Bitcoin which was based on blockchain.

What is Blockchain?

According to IBM's definition "Blockchain is a shared, immutable ledger which helps in recording the transaction and allow you to track the assets in a business setup." They further define assets as tangible, i.e. a house, a car and So on and intangible, i.e. patents,intellectual property and so on. With

blockchain we can track anything virtually, without any cost and risk involved. As we all know, information is the new oil and for any business, the faster the information is transferred the more accurate it becomes. Blockchain is the best option for this as it provides shared, fast and transparent information which can only be accessed by the members.

Elements of Blockchain:

Distributed Ledger: The ledger that is used is distributed over different nodes; hence, only the network participants have access to it. With this distribution, the transaction is recorded only once and updated on these different nodes; hence eliminating the chance of duplicity and making it immutable.

Immutable Records: The transaction or information is added in something we call "Blocks", that contains the hash value of the previous block and its own hash with information. This is then shared with all the members, and with consensus, it is accepted by all. . No member can change the information as changing would mean changing the hash values and getting the consensus, which is nearly impossible to do, making the records immutable.

Smart Contract: To make the transaction faster, there are smart contracts which are sets of rules stored in blockchain and get executed automatically.

How does blockchain work?

Every transaction that happens is recorded in a block. Whether the transaction is tangible or intangible. These blocks contain the information, hash value and hash value of the previous and the next block hence forming a chain. Every block is the strength and the verification of the previous block. Then the block is

distributed among the members of the network who validate the block and store the information with consensus. This makes the blockchain immutable and it is impossible to tamper with it.

Types of block chain

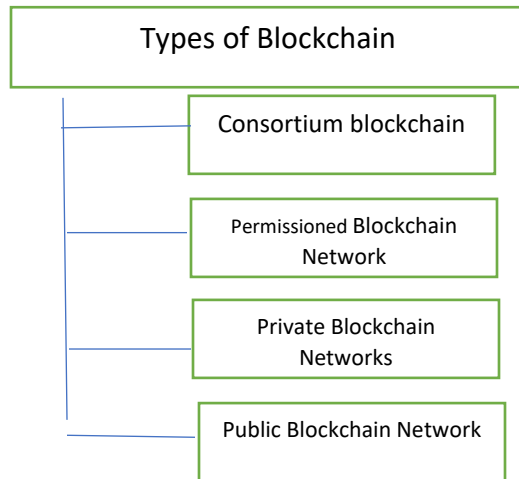


Fig1.Type of Block Chain

Effects Counterfeiting In Products:

In 2016 there was a research by Organization for International Cooperation and Development and Intellectual property office of the European Union showed that the counterfeit products cost around \$509billions which is about 3.3% of import. Luxury products like designer clothes, shoes, bags and so on all these items get counterfeited very rapidly, apart from items like alcohol, meat, medicine, toiletries and tobacco which are also products which get counterfeited. In the pharmaceutical industry counterfeiting has very dangerous implications due to the fact that people are dying by getting their respective treatments from fake medications. In 2009, two months were monitored in developed countries and it was found that 34 million people lost their lives due to fake medications, accordingly to WHO. Due to this many companies are exploring options in order to create a more transparent and reliable supply chain, for product authentication and build a trust within their respective consumers. One of the most reliable options that companies are exploring nowadays in blockchain. With IoT sensors, blockchain has revolutionised the supply chain

system and creating a cost efficient ecosystem for supply chain transparency. This system enables the real time records to be shared with customer which are verified by the members. With this technology, customers can authenticate the product.

Major Challenges in Authentication verification

There are three major challenges with the traditional product authentication methods

1. Easy methods do not provide adequate security
2. Robust methods requires extreme level of expertise, hardware and are costly
3. Various authentication methods are not easy to integrate with enterprise.

However there are many technologies which are available in the market for authentication, such as, QR codes, serial numbers and 2D codes. These methods are simple and cheap but also very easy to crack or copy to use them. Hence, a very high chance of counterfeiting due to them. Hologram is also one the famous technique for product authentication. However, it can only be used by experts. Holograms can also be copied very easily by novice people . There is also technology like RFID tags,however, they are very expensive.

Blockchain Purchasing Management Solutions can enable participants to overcome the challenges of data transfer, identity verification, and privacy. The technology allows for the verification of provenance with greater certainty by simplifying the data transfer process and synchronizing transactions. Blockchain and distributed spreadsheets keep consistent records of products such as price, location, and movement to protect each information. Additionally, it is possible to create information that can be verified by smart contracts in order to improve the visibility of the data for the benefit of all participants.

The accuracy of initial data is an important factor in supply chain management. Blockchain requires accurate initial product data to deal with fraud and labeling issues. The ability to block

unchanging records of all transactions is the basis for validating validity in SCM. The blockchain can keep track of time chronology in order to easily identify fraudulent or erroneous activities. Maintains activity records encrypted cryptographically. Duplication of data throughout the network makes the record available to any supply chain participant. The technology establishes trust in many data sources by providing visibility over the source of data related to the supply chain product.

Every product has a unique serial number or identification code. It is possible to store such information in a blockchain such as initial data or product id. Third-party services such as transportation will ensure the addition of unique hash data to the product id in the blockchain. Participants in the supply chain as distributors and vendors add unique hash data to the product id respectively. It is possible to track activity history and product movements by tracking hash data in the blockchain. It simplifies the process of tracking product exposure details. The hash data and product id are unchanged and each transaction has a record in the blockchain. It effectively strengthens counter-fraud measures. It is also possible for consumers to verify the authenticity of the product with the original identifier or product ID.

Conclusion:

From 1991 when the term was coined to the two decades later when it actually came into application, blockchain has been one of the most secure databases to authenticate product validity. From cryptocurrency to healthcare, it has its application everywhere to safeguard the data and keep the transparency of the customers. With all these usefulness of the blockchain, it is the future. While we are entering the third decade of it we will be able to observe its application more and more in day to day lives.

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“Technology should improve your life... not become your life.”

CLOUD CONCERN

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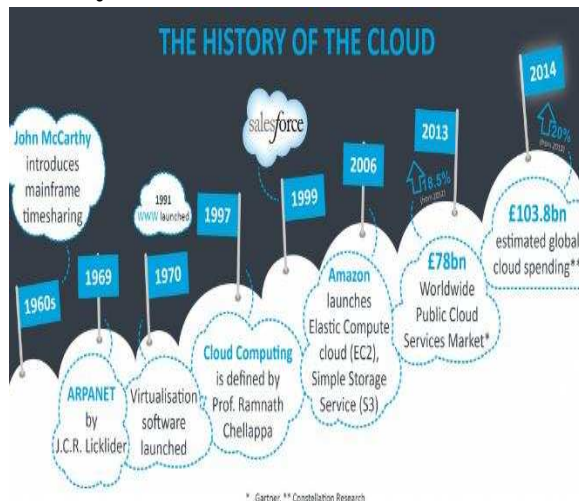
INTRODUCTION

Before starting the discussion regarding the concerns that surround cloud computing, let's just briefly discuss what cloud computing is. Well, cloud computing revolves around anything that is delivered over the Internet. It includes servers, databases, storage, networking, and analytics. Since demand for cloud computing is increasing, so are the concerns. Normally, if we try anything, the thing we prioritize is whether it is safe to use or not. What does it need saving from?

CLOUD ACQUIREMENT

Over the years, cloud computing has been growing significantly, ensuring security as well as providing stability to its users. One doesn't actually feel comfortable sharing their data with the other person or an organization. Let's dive into how it started, or let's say, the history of cloud computing and how it developed.

History



The figure can give you an estimation of how cloud computing has developed over the years until now.

One of the most recent and fastest growing technologies. The very first investment in cloud technology was made in 1963 by DARPA (Defense Advanced Research Projects Agency), and it gave birth to the term "visualization" in the computer world. Google as well as Amazon used the Cloud Computing model, but later Amazon introduced AWS (Amazon Web Services), which became the platform to provide online services to other websites.

CLOUD ESSENTIAL

With the rapid growth of cloud computing in the IT industry, it would not be surprising to an individual that certain credentials as well as certifications are needed. Cloud Essential is a beginner-level as well as vendor-neutral cloud certification offered by CompTIA, Cloud Essential+. Cloud Certification is not meant only for technical people, but certifications by Cloud Essential + are meant for non-technical individuals as well. The doubt which few of us may have is: why the hell do we need this certification? Well, the answer to this query is simple. Certificates objective is to substantiate the following features:

- 1) Basic principles of cloud computing design.
- 2) Judge the cloud services implementation
- 3) Supposed perils surrounding it.

CLOUD FUEL

We all know how the cloud works over virtualization, thus making it a remote premise, i.e., a premise that is far away from an organization. The data centre serves as the fuel in this case. Cloud computing fuel is setting the trend by offering something new like server-less computing and function as a service, thus

providing a better experience in the cloud. AWS Lambda was introduced in 2015 by Amazon and a new concept, which is function as a service, was introduced.

CLOUD TECHNOLOGY

To provide access to any user for storing files, software, and services, cloud technology is used through their internet connected devices. Instead of using a hard drive for storage purposes, the mode has been shifted to the internet by both hardware and software.

Hardware

Well, when we discuss cloud hardware, the very first words that strike our mind are server and memory. A collaborative, amalgamated server resource when delivered and hosted over a network is a computer server, whereas memory or storage is assessed logically.

Software

It is done in order to achieve the physicalization of virtualization. The hypervisor is a software used for that purpose. Hyper-V and VMware are major examples of hypervisors.

BIG GIANTS or CLOUD DEALERS

While businesses are implementing more multi-cloud setups, cloud giants are gaining a larger share of IT spending. Money is pouring into Microsoft Azure and its software-as-a-service offerings, as well as Amazon Web Services, according to a recent Flexera study on IT budgets for 2021. Big data and analytics workloads are also gaining traction on the Google Cloud Platform.

According to statistics, the global cloud infrastructure services market rose 42 percent year over year in the first quarter of 2019, with Amazon Web Services (AWS) seeing the largest increase in monetary terms, with sales up to \$2.3 billion (41 percent) over 2018. Despite growing sales by \$1.5 billion or 75%, this result moved AWS further ahead of second-placed Microsoft. In terms of percentage growth,

Google was the quickest of the top three, rising 83 percent from \$1.2 billion to \$2.3 billion.



CLOUD CONCERN



The data stored on the Internet often contains confidential information such as addresses, payment details, and medical records that become the victim of cyber criminals. Security measures have been put in place to combat cyber threats and vulnerabilities, ensuring that anonymous information will not endanger those whose confidential information is released.

Data Stealing

As the name suggests, data theft is the stealing of someone's information that isn't meant for the public and using it for one's own benefit. The number of approaches may be infinite, but all results are the same. Yahoo, LinkedIn, Facebook, and Zoom are some common platforms where data stealing is common.

Security Bridges

Any unauthorised access of data resulting in the stealing of data is one of the major security breaches

which everyone faces. A recent Facebook breach exposed the personal information of 533 million users.

DO YOU KNOW?

- 1) In today's digital world, your identity is more likely to be stolen than your car, which is stolen or looted.
- 2) AWS is a market monarch in the cloud computing industry, with more than 31% of the global market share among competitors such as Microsoft, Google, IBM, and others.
- 3) We can now claim that AWS has a minimum of 1 million active customers in 190 countries, including 5000 schools, 2000 government entities, and 17500 charities.
- 4) With the increase demand, it may not come as a surprise that cloud computing would see 44% increases or grow 44% more in the next 5 years.
- 5) More than 90% businesses find cloud computing better in terms of security.



Fig 1: Challenges faced in cloud computing

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“If it keeps up, man will atrophy all his limbs but the push-button finger.”

CUSTOMER RELATIONSHIP MANAGEMENT SOFTWARE

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INTRODUCTION

Customer Relationship Management (CRM) is a term that refers to the management of customer relationships. When people hear the term CRM, they usually think of CRM programming, which acts as a single vault for bringing your company, marketing, and customer service activities together, as well as smoothing out your interaction, strategy, and implementation. With more businesses adopting a hybrid work paradigm, you'll need a "remote CRM" to keep your far-flung outreach staff productive and provide them with the tools they need to collaborate with their peers and attract new clients.

CRM – The Software

The origins of today's CRM frameworks can be traced back to the late 1980s and early 1990s, when Contact Management Systems (CMS) were established, which later evolved into Sales Force Automation creativity. As the business grew, sellers were pressed to provide a broader range of services, including everything from advertising to presales and maintenance.

Customer relationship board programming is intended to eliminate storehouses of client data by socialising them in a focal spot, giving a 360° perspective on the entirety of your client information. Subtleties like the client's name, email, telephone number, and correspondence inclinations can be made accessible to help your groups connect with clients for the right reasons and through the right channels.

Why businesses choose a CRM system

CRM is the biggest programming market on the planet, and has been progressively shown to be the

most innovative resource that organisations can put resources into. With the unmistakable quality that the cloud CRM programming market has been acquiring throughout the long term, and the straightforwardness with which CRMs can coordinate with different applications that organizations by and large use, CRM frameworks help practitioners cover each part of their business cycle with an increment in deals and showcasing returns, all while assisting them with reducing down on their expense.

What is the aim of a customer relationship management system (CRM)?

Whether you're a small business looking for a place to store data and make it accessible on a variety of devices, or a large corporation looking to manage client collaborations and increase customer loyalty, you'll eventually need a customer relationship management framework if your flow of interaction can't find solutions to these squeezing issues. Consider the following pointers for a cloud-based CRM:

1. Getting answers to the most basic questions

Inquire about whether you can discover quick answers to the most basic questions, such as: how many clients do I have, and how many did we win or lose in the last quarter? How much do I think I made last month? Who was the most successful in shutting down the most arrangements?

2. Checking the entry of incorrect data

Awful choices come from terrible information. The inability to check the exactness of information entering your framework is a genuine reason for concern. When you have an approval conspire with a computerised information section, the inflow of wrong data can be forestalled before it raises any ruckus.

3. Connecting with customers and prospects

Clients can emerge out of an assortment of mediums—sites, web-based media, calls, and so forth—and just a multi-channel correspondence framework can carry them nearer to your business and allows you to cover all client contact focuses that are pertinent to your selling interaction.

4. Personalizing marketing efforts

Your marketing efforts can basically go down the channel if your techniques are not drawing in possibilities to evaluate your administration. Errands like conveying advancements, pamphlets, and so on can be customised to guarantee that they identify with each client on an individual level.

5. Bringing teams together

At the point when each group is their very own island, it turns into an enormous bottleneck for any association trying to develop. Constant client data can't be shared across groups, which thus influences the manner in which you serve your clients' needs.

How CRM is valuable for an organization

Client relationship The executive frameworks can be effectively redone to meet the particular needs of any business type and size. Client Connection: The board programming is used by new businesses, large projects, and verticals to extend their business, market, and customer service efforts.

1. B2B

B2B firms benefit from a business CRM setup for everything from dealing with a record's contact info to staying on top of business agreements, instalments, and reports. It aids them in developing a standard stage to keep their associates, merchants, and other business partners in a state of harmony with one another.

2. B2C

Because B2C businesses have shorter client life cycles, they typically require a solution that is both easy and time-consuming. B2Cs can connect their clients more easily with a multi-channel CRM system that includes features like leading the board, delivering moment overviews, promoting computerization, and so on.

3. SMBs

SMBs aren't just small or medium businesses; they're also clever and sophisticated enterprises. The popular belief that cloud CRM is too expensive and sophisticated for small businesses is untrue. They can always start with a free CRM solution to get their CRM feet wet. Small business CRM systems give SMBs a level playing field and the capacity to compete against larger competitors in their market by acting as a technology equaliser.

4. Enterprises

With cutting-edge CRM features like work process executives, advanced investigation, domain the board, deals, and promoting automatic technology, the undertaking CRM framework can help salespeople spend less time on unimportant errands, have more time to focus on their clients, and bring their tasks together across different geographical locations.

CRM systems are divided into several categories:

1. On-premise CRM

One of the first decisions a company must make is whether to use an on-premise or cloud CRM system. On top of the licencing cost for the actual software, an on-premise CRM system often requires the organisation to set up the entire back-end infrastructure and foot the expense for maintenance and upgrades.

2. Cloud-based CRM

A cloud CRM system is frequently the preferred solution for enterprises since it is freely available via any browser, allowing for faster deployments and usage. Other advantages include minimal upkeep or maintenance costs, easier access to your data when you need it, and the ability to scale up and down quickly.

3. Industry-specific CRM software

There are numerous sellers in the market who offer CRM programming that is explicitly worked from the beginning to satisfy the specialty prerequisites of various ventures. Committed CRM programming is available for industry verticals such as real estate, medical care, security, financial administrations, media organizations, hospitality, and the sky is the limit for all.

4. All-in-one CRM solutions

The most well known cloud CRM contributions will in general be these across the board CRM arrangements that are strong, amazingly adjustable and incorporate with a wide scope of famous business programming to give a 360 degree perspective on your clients. They are feature-rich, secure, and simple to utilize, permitting organisations of various sizes and from various ventures to use them successfully and see a prompt positive effect on their business activities.

CRM in service industries

To all the more likely fathom CRM for corporate customers, we should initially perceive the critical

contrasts between CRM for corporate customers and CRM for purchasers; CRM for corporate customers' intricacy. This is supported by Webster, who claims that, as part of CRM, corporate customer marketing can be defined by the complexity of items and the purchasing process.

In spite of the fact that there are essential equals, like the way to deal with market arranging, Coviello and Brodie perceive that "promoting looks more social in B2B [business-to-business] firms and more value-based in shopper firms." As indicated by Gummesson, B2B CRM comprises continuous business, CRM for buyers centres around day-to-day exchanges. For customers, there is no dynamic administration of administration level arrangements.

CRM - The Strategy

How organisations approach client associations and building associations with them shapes their CRM methodology. It entails gathering client information and dissecting the historical backdrop of client connections in order to provide better types of assistance and build better relationships with clients, ultimately driving deals and income.

1. Building great customer relations

Exceptional customer relationships rely on your company's trustworthy and personalised experience, regardless of where a client is in the sales cycle. This means that when communicating with a consumer, every department in your firm, from marketing to sales to customer support, should give a uniform experience.

This may be useful, but it isn't appropriate when your organisation is just getting started and you're dealing with all of your client data on bookkeeping pages. The time spent on the information part could be better spent on attracting clients and closing deals. When you grow your firm and expand your client base, this becomes significantly more complicated. This is where CRM programming plays a crucial role.

With customer relationship management software, you can build remarkable relationships.

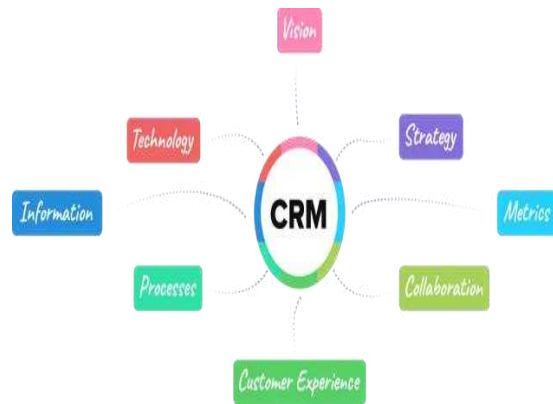


Figure : 1 Source: Gartner research

Why Is CRM Software Necessary for Your Business?

If you are starting a customer relationship management project, look for these warning signs:

1. Centralization is lacking.

When your customer's information is scattered throughout your dominate sheets, business cards, and notes gathered during meetings with the client, it's difficult to make critical information. It must be gathered and analysed, which takes time and effort.

2. Breakdown in communication

Marketing, who keeps the lead alive, and sales, who closes the deal, need to work together. This lack of a data stream frequently undermines the presentation of the two groups, as neither knows what the other is doing.

3. Turnover is costly in terms of both time and money

When agents leave your company, they take the customer relationships they built with them. The company must invest time and money into developing replacements and bringing them up to pace with customer expectations.

4. Lack of knowledge

This is the first indicator's derivative. If you don't have a centralised repository for your customer data, salespeople will find it tough to keep track of every detail as your customer base expands.

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"Technology like art is a soaring exercise of the human imagination."

DATA DRIVEN DECISION

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INTRODUCTION

As human beings, we often make split-second decisions based on intuition, without taking the outcome or consequence into account. Through the process of data-driven decision making (DDDM), you can ensure that your business needs and objectives are guided well.

Data-driven decision-making (DDDM) uses facts, metrics, and data to guide strategic business decisions that align with the goals, objectives, and initiatives of When organisations realise the full value of their data, that means everyone—whether you're a business analyst, sales manager, or human resource specialist—is empowered to make better decisions with data every day. However, this is not achieved by simply choosing the appropriate analytics technology to identify the next strategic opportunity.

Why DDDM Is Important?

The significance of information in choice lies in consistency and continual growth. It empowers organisations to set out new business plans, open doors, create more income, anticipate future patterns, enhance current functional endeavors, and produce significant experiences. That way, you will continue to develop and advance your domain over the long haul, making your association more versatile. The advanced world is in a consistent state of motion, and to keep up with the steadily changing scene around you, you should use information to make more educated and incredible information-driven business choices. Information-driven business choices represent the moment of truth for organizations. This is a demonstration of the significance of online information representation in this dynamic.

Components of DDDM

There are three key components to successful data-driven decision making.

1. Data Accuracy and Relevancy

First and foremost, you need to guarantee that your data isn't only accurate but additionally applicable to what you are hoping to accomplish with your objectives. Settling on choices dependent on mistaken data can have gigantic ramifications on your business results, and dissecting data that isn't applicable to your objectives simply adds to the wilderness of shortcomings that you and your association could be confronting.



Figure: 4

2. Critical Reasoning

It is a sort of thinking design that expects individuals to be intelligent and focus on a dynamic that directs their convictions and activities. Basic thinking enables people to deduce with more logic, to deal with modern data, and to consider various sides of an issue in order to reach more solid conclusions.

3. Data Driven Culture

- Furthermore, your association needs to guarantee that there is a "data culture" that urges workers to think basically.
- In this day and age, it is essentially insufficient to simply approach precise, important data.

Having a culture that pushes individuals to be interested with regards to information and contemplate how to utilise and prevail with the information is the other piece of the information-driven dynamic riddle.

- **Data Denial:** Organization begins with a functioning doubt of information and doesn't utilize it.
- **Data indifference:** Company has no interest in whether information is gathered or utilized.
- **Data aware:** Business is gathering information and may utilize it for checking, yet it doesn't put together choices with respect to it.
- **Data informed:** Managers use information specifically to help dynamic.
- **Data Driven:** Data assumes a focal part in however many choices as could reasonably be expected across the association.

Effective steps to data-driven decisions

These steps can assist you in determining the "who, what, where, when, and why" of data for you, your colleagues, and the business. But keep in mind that the cycle of visual analysis isn't linear. One question often leads to another, which may mean you need to go back to one of these steps or skip to another—eventually leading to valuable insights.

Step 1 - Identify business objectives: This progression will require a comprehension of your association's chief and downstream objectives. This could be just about as explicit as expanding marketing projections and site traffic or as uncertain as expanding brand mindfulness. This will help you later in the process to pick key execution markers (KPIs) and measurements that impact choices produced using information—and these will assist you with figuring out which information to break down and what inquiries to pose so your investigation upholds key business destinations. For example, if a showcasing effort centres on driving site traffic, a KPI could be attached to the measure of contact entries caught so deals can circle back to leads.

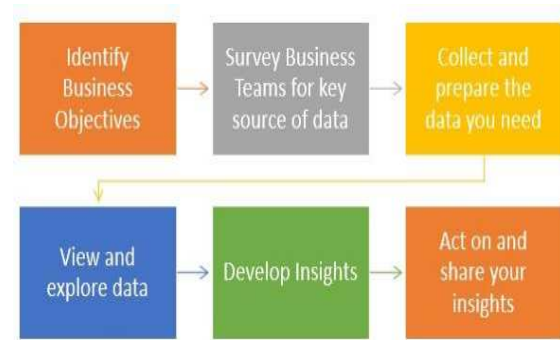


Figure: 2

Step 2 - Survey business teams for key sources of data: To ensure a positive outcome, it is critical to obtain input from individuals throughout the organisation in order to understand the short- and long-term goals. These information sources assist with advising on the inquiries that individuals pose in their investigation and how you focus on guaranteed information sources.

Significant contributions from across the association will assist in directing your examination arrangement and future state—including the jobs, obligations, engineering, and cycles.

Step 3- Collect and prepare the data you need: Accessing quality, trusted data can be a big hurdle if your business information sits in many disconnected sources. Once you have an idea of the breadth of data sources across your organization, you can start data preparation.

Start by preparing data sources with high impact and low complexity. Prioritize data sources with the biggest audiences so you can make an immediate impact. Use these sources to start building a high-impact dashboard.

Marketing agency Tinuiti centralised more than 100 data sources with an analytics platform that supports faster data preparation to create custom dashboards for 500-plus clients and give them the full storey of their brand efforts.

Step 4 - View and explore the data. Picturing your information is pivotal to DDDM. Addressing your bits of knowledge in an outwardly significant manner implies you'll have a superior shot at

affecting the choices of senior administration and other staff.

With numerous visual components like charts, charts, and guides, information perception is an available way of seeing and getting patterns, exceptions, and examples in information. There are numerous well-known representation types to adequately show data: a bar outline for correlation, a guide for spatial information, a line diagram for fleeting information, a dissipate plot to look at two measures, and that's only the tip of the iceberg.

Step 5 - Develop insights: Basic thinking with information implies discovering bits of knowledge and imparting them in a valuable, connecting way. Visual examination is an instinctive way to deal with asking and answering questions about your information. Find openings or dangers that sway achievement or critical thinking.

JPMorgan Chase embraced an advanced investigation solution to settle on choices that are imperative to the bank's wellbeing. By assessing line-of-business connections (for example, items, advertising, and administration contact focuses) with client information, JPMC acquires an exhaustive perspective on the client's excursion. For instance, the Marketing Operations group performs examinations that impact plan choices for the site, special materials, and items like the Chase versatile application.

Step 6 - Act on and share your insights: When you find an understanding, you need to make a move or offer it with others for coordinated effort. One way of doing this is by sharing dashboards. Featuring key bits of knowledge by utilising educational text and intelligent representations can affect your crowd's choices and assist them in making more educated moves in their day-to-day work.

Benefits of DDDM

DDDM isn't bound to enormous organisations and government bodies with tremendous assets. Associations of any size can utilise data-driven dynamics to change their cycles.



Figure: 3

With DDDM, associations become more light-footed, recognise new business openings sooner, and react to showcase changes all the more rapidly. With close-constant data assortment, directors can quickly gauge results and make a quick input circle. These capacities make data-driven organisations especially client-engaged and more aggressive. The equivalent is valid for associations and specialist organizations, like state-funded training offices.

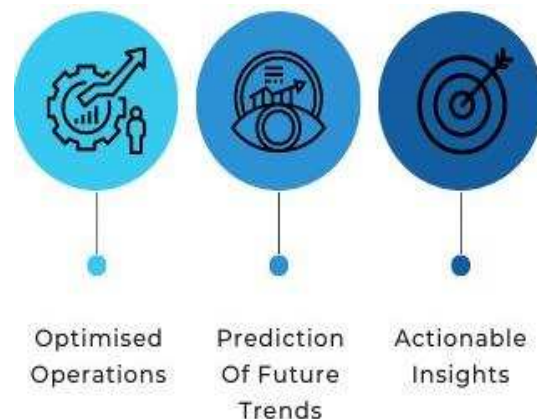


Figure: 4

Data-driven dynamics prompt more noteworthy straightforwardness and responsibility, and this methodology can further develop collaboration and staff commitment. DDDM strategies demonstrate that whims or crazes are not driving the organization, and morale rises as people see that target data backs up administration decisions.

In associations that focus on data-driven dynamics, objectives are concrete, and results are estimated. Colleagues regularly feel a more noteworthy feeling of control since they can see the goal lines unmistakably. The tenor of associations might turn

out to be more certain on the grounds that conversations are truth-based, instead of driven by a sense of self and character. Data-driven investigation can pay for itself through cost reserve funds and higher incomes. Most associations gather data, generally for record-keeping and consistence, however many don't do anything with this data. Regularly, they bring about capacity costs for keeping the data

Case studies

These four Case Studies Explaining Why A Data Driven Decision Making for Digital Businesses Is important.

Facebook

Facebook discovered early on that democratising data access — that is, making it widely available — enabled the organisation to be significantly more nimble and receptive to advertising changes and product advancements. In one illustration of the effect of this methodology, Facebook took a glance at the number of individuals beginning to utilise a component through which they could request a companion to bring down a photograph of them. However, at that point, they abandoned that demand when they understood they needed to compose a message to the companion clarifying why. If they auto-populated an example message, the number of clients who completed the solicitation increased from 20% to 60%. That data drove the choice to make the auto-populated message an authoritative part of the instrument.

Netflix

A captivating illustration of data-driven dynamic comes from video-web-based feature Netflix, a forerunner in unique programming. (As indicated by a 2018 Morgan Stanley study, 39% of U.S. shoppers say Netflix has the best unique programming — near threefold the number of as their closest adversary, HBO.) What's Netflix's confidential? The organization utilized data investigation to construct a profoundly itemized image of purchasers' preferences for recordings.

Google

Then, there's Google's Project Oxygen, a drive began in 2008 that mined data from execution evaluations, overviews, and different sources, fully intent on growing better administrators. The venture took a gander at the contrasts between awesome and most exceedingly awful supervisors in the organization dependent on in excess of 100 factors. Google utilized the outcomes to make preparing programs for chiefs and recognized the eight most significant practices of high-performing supervisors, beginning with great instructing. The outcome was an improvement in administration and results, for example, staff maintenance and fulfillment. (Quite a while later, Google refreshed the examination, and in 2018, they invigorated the rundown of supervisor practices and added two more.)

Walmart

Sometimes, the aftereffects of information driven dynamic are somewhat less impressive; however regardless establish grand slams for a business. In 2004, for instance, Walmart utilized item buying information from regions where typhoons had struck to discover what individuals purchased when they loaded up before a tempest. The organization needed to utilize prescient investigation to decide how to supply stores in front of future tempests.

They tracked down that notwithstanding staples, similar to spotlights; stores saw weighty interest for surprising things. Deals of strawberry Pop-Tarts bounced seven-overlay as a delicious durable that doesn't need cooking, and brew was the top-selling thing. The retailer started sending trucks stacked with these things to stores in regions where typhoons were figure, and deals were lively.

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DATA MINING TRENDS, OPPORTUNITIES AND RISKS

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INTRODUCTION

Data mining, also known as knowledge discovery in data (KDD), is a process of uncovering patterns and other information that is valuable from large datasets. Given the evolution of data warehousing technology and the growth of big data, adoption of data mining techniques has been accelerated over the last couple of years, helping companies by transforming their raw data into organised and useful knowledge. However, despite the fact that technology is evolving every day, it is evolving in a way that it can handle data at a large scale, which means it is still facing challenges with scalability and automation. A search engine receives billions of queries each day, amounting to trillions of searches per year. To show the relevant information from this huge data set, the search engine uses very distinct patterns to analyse the data. Mining is a very broad term featuring the process of finding a small set of data from a heap of raw data. Data mining techniques are suitable for simple and structured data sets. The challenge for data mining is to design fast and light mining methods for data streams. Another the challenge is that the stream mining algorithms need to detect rapidly changing concepts and data distribution and adapt to them.

Data Warehousing

A data warehouse is a type of data management system that is specifically designed to enable and support business intelligence (BI) activities. Data warehouses are only intended to perform queries and analysis and mostly contain very large amounts of historical facts and figures (data). The data within a data warehouse is usually taken from a wide range of sources, such as application log files, et al.

These four keywords' data warehouses are from the other repository systems:

SUBJECT ORIENTED: A data warehouse is generally organized around many subjects like in that of a company warehouse. Instead of focusing on operations and organization on transactions, it focuses on analysis of data.

INTEGRATED: A warehouse is constructed by incorporating several heterogeneous sources such as files, historical records, databases, etc.

TIME VARIANT: Data is stored so that it can be processed to extract information from the current available data.

NON VOLATILE: A data warehouse is always a separate unit from the operational unit that's why it doesn't need and control and processing mechanisms. It requires only 2 types of operations: loading and accessing of data.

Scope of Data Mining

Databases are of massive size and quantity; data mining technology can help in generating new business opportunities by providing these capabilities:

i) Predicting different trends and behaviors all around the different industries. It automates the process of finding predictive information in large databases. Questions that usually require extensive hands-on analysis can now be answered directly from the data quickly. A typical example would be targeted marketing. Data mining uses data on past promotional campaigns to identify the targets most likely to maximize ROI. Other predictive problems

include forecasting major events like natural calamities, market analysis, etc.

ii) Discovery of previous unknown patterns. Data mining tools search through different databases and identify patterns which were previously hidden. An example of pattern discovery is to analyze retail sales data to identify the unrelated products that are often purchased together or detecting fraudulent credit card transactions.

Data mining techniques can yield the benefits of automation on existing hardware and software infrastructure and can also be implemented on new systems as existing platforms are upgraded and new products are being developed.

When data mining tools are implemented on much capable hardware, they can analyze massive databases much faster, which means that user can work and experience with more models to understand complex data. Larger databases, returns improved and accurate predictions.

Applications of Data Mining-

- Financial Data Analysis
- Retail Industry
- Telecommunication Industry
- Biological Data Analysis
- Intrusion Detection
- Other Scientific Applications

Financial Data Analysis

Data Mining in banking and financial industry is used for designing as well as construction of the data warehouses for multidimensional data analysis and data mining.

Customer's credit policy analysis and loan payment predictions.

Detection of money laundering and other financial crimes.

Retail Industry

Data Mining in retail industry is used for identifying the trends of the buying patterns of the customers which helps in analyzing the effectiveness of the

sales campaign, customer retention and product recommendations.

Telecommunication Industry

Data Mining in this section of the industry is used for analyzing the telecommunication patterns, fraudulent and unusual patterns, making better use of resources and improving the services, multidimensional association and sequential pattern analysis and use of visualization tools.

Biological Data Analysis

Data mining can be used for semantic integration of heterogeneous and proteomic databases.

Association and path analysis

Visualization tools in genetic data analysis.

Alignment, Indexing, multiple nucleotide sequences.

Intrusion Detection

Here the data mining can be used for developing the algorithms for data mining.

Association and correlation analysis.

Analysis of stream data.

Distributed data mining.

Visualization and query tools.

Other Scientific Applications

Data mining in other scientific applications include data warehouse and data preprocessing, graph-based mining and visualization and domain specific knowledge.

Current Trends of Data mining

- Embedded Data Mining
- Visual Data Mining
- Biological Data Mining
- Web Mining
- Distributed Data Mining
- Real Time Data Mining

- Multi Database Data Mining
- Data Mining and Software Engineering
- Application Exploration
- Scalable and Interactive Data Mining Method

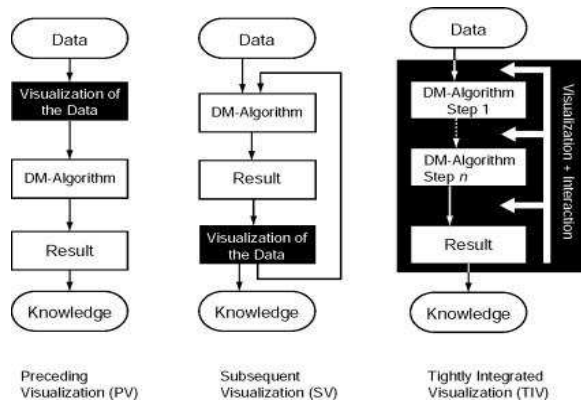


Fig 1: Visual data Mining.

Data Mining Techniques

There are various major data mining techniques that are currently in development phase and are being used in the data mining projects like association, classification, clustering, prediction, sequential patterns, and decision tree, etc.

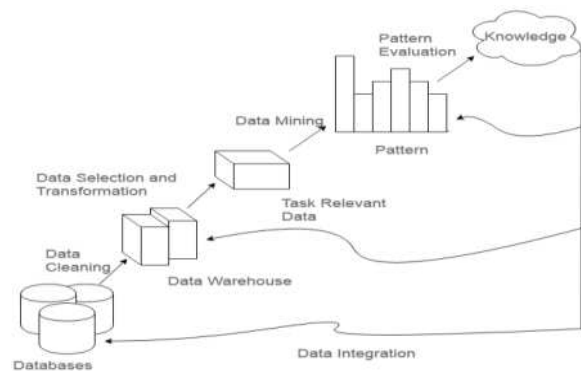


Fig 2: Representation of Data Mining

Types of Data that can be mined

Time-Series data

A time series is a data set that tracks a sample over time. A time series allows one to see what factors influence certain variables from period to period. Time series analysis can be useful to see how a given

asset, security, or economic variable changes over time.

Symbolic sequence data

A symbolic sequence consists of an ordered set of elements or events, recorded with or without a concrete notion of time. There are many applications involving data of symbolic sequences such as customer shopping sequences, web click streams, program execution sequences, biological sequences, and sequences of events in science and engineering and in natural and social developments.

Biological sequences

Biological sequences generally refer to sequences of nucleotides or amino acids. Biological sequence analysis compares, aligns, indexes, and analyzes biological sequences and thus plays a crucial role in bioinformatics and modern biology (e.g., DNA and protein sequences).

Graph pattern Mining

Graph pattern mining is the mining of frequent subgraphs in one or a set of graphs. There are two methods for mining graph patterns: Apriori-based and Pattern growth-based approaches. Alternatively, we can mine the set of closed graphs where a graph g is closed if there exists no proper super graph g' that carries the same support count as g . Also, there are many diverse patterns of graph, which includes: approximate frequent graphs, coherent graphs, and dense graphs.

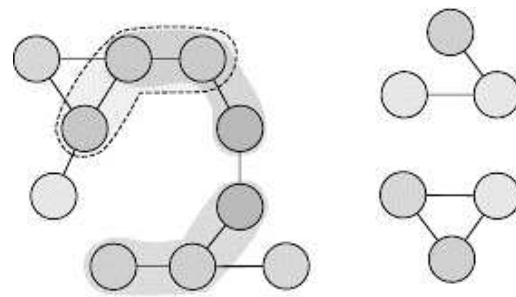


Fig 3: Graph Pattern Mining

Cyber-Physical System (CPS) Data Mining

A CPS system consists of large quantity of interacting physical and informational components. Example of a CPS is patient care system. Data generated in CPS is inconsistent, interdependent, dynamic, volatile, and noisy. This type of mining requires linking a large information base with the current situation, performing real-time calculations, and returning prompt responses.

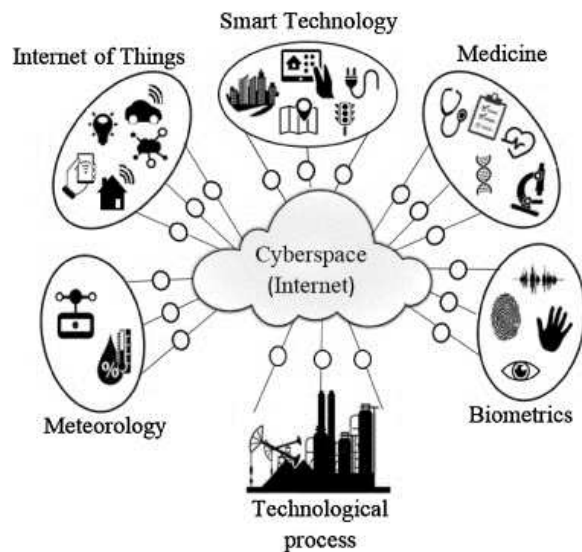


Fig 4 : CPS Data Mining

Web Data Mining

It is among one of the applications of data mining techniques that is used to discover patterns, structures, and knowledge resources from the web. According to the recent target analysis, web mining is classified into the following: web content mining, web structure mining, and web usage mining. Web content mining analyses web content of the forms text, multimedia, and structured data. This is done to understand the content of the webpages, provide scalable and informative keyword-based page indexing, matrices, and other valuable information related to web search and analysis. Web structure mining is the process of using graph and network mining theory and methods to analyze the nodes and connection structures on the web. It extracts patterns from hyperlinks, where a hyperlink is a structural component which connects a web page to another location. Web usage mining is the process of

extracting useful information from, many server logs. It finds patterns related to general or groups of users; understands users' search patterns, trends, and associations; and predicts what users are looking for at the right time on the internet.

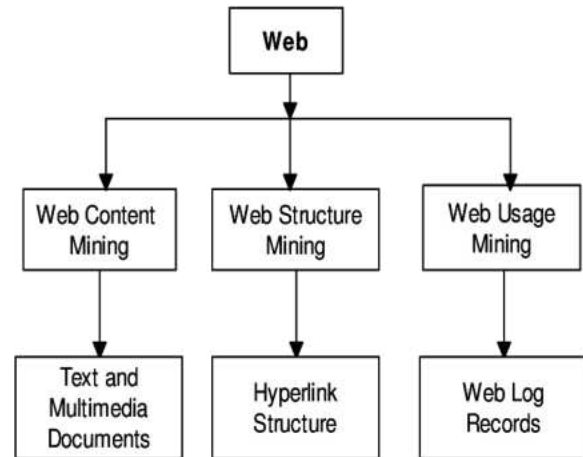


Fig 5: Web Mining

Visual Data Mining

This type of mining helps us to discover implicit and useful knowledge from huge data sets using various visualization techniques. It essentially combines the power of both the senses that is, eyes as well as brain, making it a highly attractive and efficient tool for data distribution patterns. It can be viewed as an integration of two disciplines: data visualization and data mining. The data visualization mining can be achieved in the following ways:

1. Data Visualization
2. Data mining result visualization
3. Data mining process visualization
4. Interactive visual data mining

Statistical Data Mining

This technique is basically derived from various computer science fields. This technique is designed for efficient handling of huge amounts of multi-dimensional complex data. This technique is particularly designed for numeric data. The following mentioned are the methods used in this technique:

1. Regression
2. Generalized linear models
3. Analysis of variance

4. Mixed-effect Models
5. Factor analysis
6. Discriminant Analysis
7. Survival Analysis
8. Quality Control

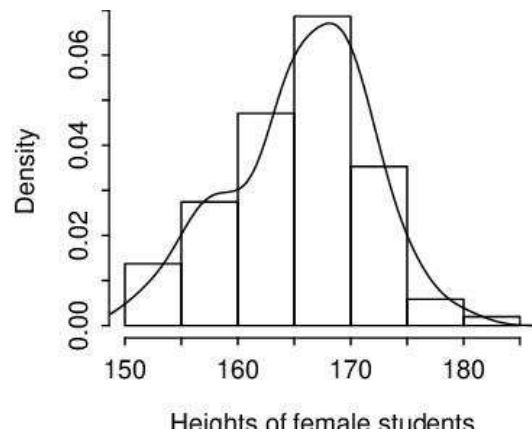


Fig 6: Statistic Graph

Risks of Data Mining

Some of the risks of data mining are:

- Privacy Issue – Some of the data mining companies extract the various information about the other companies and use them to gain their personal benefits. For e.g. in online shopping, they extract the information about the specific product of a company in demand and displays to the customers the alternative/competitive product of that specific product from other companies.
- Manipulation Issue – Data Mining is also used for creating and spreading false propaganda on various social media platforms which leads to the creation manipulation among the people.
- Misuse of information – Now a days various fraudulent companies use data mining techniques to exploit the personal

information about innocent people and target them to earn money from them.

- Inaccurate Data –At any time, there are two main kinds of data available for the data miners – good data and the bad data. Unfortunately, the internet is the collection of information that is more than required. When companies don't get the proper data or does not collect the right data, they're prone to use incomplete, duplicated, or outdated data.

Conclusion

With this, we can have a basic knowledge of what data mining is. Why is it a hot topic? Etc. Also, we learnt about the concept of data stream. Later, the scope of data mining, application of data mining, current trends, ways to mine the data, and how these things are used in the development of hardware and software and then further used in different fields where the previous data can be valuable to improve in the future. In spite of the research that has been done on data mining's application in data stream mining so far, there are still many areas where research in data mining can be helpful in the future.

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DEEP LEARNING

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INTRODUCTION

In recent years, deep learning has become a popular expression in the tech world. Profound learning has changed the whole world in the course of recent years. Consistently, more applications rely on neural networks in the fields of medical care, object location, finance, HR, retail, tremor identification, and self-driving vehicles. Concerning existing applications, the results have been reliably improving. Deep learning is also known as profound neural learning or profound neural organization.

WHY DEEP LEARNING?

The fundamental motivation to utilize Deep Learning is the size of the data. That implies DL gives brilliant outcomes in the event that you have a huge dataset. The more information you have, the better outcome it will give you. This component makes DL extremely famous. One more reason to utilize AI is self-component extraction. That implies you don't have to take care of all the components physically. DL consequently extricates all elements. The following motivation to utilize DL is problem complexity. DL can undoubtedly carry out procedures on complex real-world issues. In this way, these are three primary reasons why DL is so well known.

SKILLS REQUIRED FOR DEEP LEARNING-

DL is becoming well known step by step. Knowing about DL, in addition to machine learning, is now essential. As different fields are embracing DL, So

the information on DL is significant. So to learn DL, you ought to have the following 6 abilities:

1. Maths Skills.
2. Programming Skills.
3. Information Engineering Skills.
4. AI Knowledge.
5. Information on DL Algorithms.
6. Information on DL Frameworks. Here, I won't talk about these abilities exhaustively. Presently, its opportunity to wrap up.

HISTORY

The historical backdrop of profound learning traces all the way back to 1943, when Warren McCulloch and Walter Pitts made a PC model dependent on the neural organisations of the human mind. Warren McCulloch and Walter Pitts utilised a mix of arithmetic and calculations they called edge rationale to mirror the point of view. From that point forward, profound learning has advanced consistently over the course of the years, with two critical breaks in its turn of events.

Henry J. Kelley is credited with the advancement of the essentials of a persistent back propagation model in 1960. Stuart Dreyfus concocted a more straightforward rendition dependent on the chain rule in 1962. The idea of back spread existed in the mid 1960s, but just became helpful until 1985.

ARCHITECTURE OF DEEP LEARNING

The number of designs and calculations used in deep learning is diverse and fluctuates. This segment investigates six of the profound learning models that span beyond 20 years. Furthermore, long-term memory (LSTM) and convolutional neural networks

(CNNs) are two of the most experienced methodologies on this list, as well as two of the most widely used in various applications.

This article orders profound learning models into administered and solo learning and presents a few famous profound learning designs: convolutional neural organizations, intermittent neural networks (RNNs), long transient memory/gated repetitive unit (GRU), self-sorting out map (SOM), auto encoders (AE), and restricted Boltzmann machine (RBM). It additionally gives an outline of profound conviction organisations (Deep Belief Network-DBN) and profound stacking networks (Deep Space Network-DSN).

The artificial neural network (ANN) is the fundamental design behind profound learning. In view of ANN, a few varieties of the calculations have been concocted. To find out with regards to the essentials of profound learning and artificial neural organizations, read the prologue to the profound learning article.

Supervised deep learning

Supervised deep learning alludes to the issue space wherein the objective to be anticipated is plainly named in the information that is utilised for preparing.

In this section, we present at a high level two of the most well-known and widely used deep learning models – convolution neural networks and repetitive neural networks, as well as some of their variations.

Convolution Neural Networks

A CNN is a multi-facet neural organisation that was naturally enlivened by the creature's visual cortex. The engineering is especially valuable in preparing applications. The main CNN was made by Yann LeCun; at that point, the engineering zeroed in on manually written person acknowledgment, like postal code translation. As a profound organization, early layers perceive highlights (like edges), and later

layers recombine these provisions into more significant levels of attribution.

The LeNet CNN engineering is made up of several layers that perform various functions, such as extraction and subsequent arrangement. The picture is isolated in open fields that feed the

Then it separates the highlights from the overall picture of information. The subsequent stage is pooling, which decreases the dimensionality of the separated elements (through down-inspecting) while at the same time holding the main data (commonly, through max pooling). Another convolution and pooling step is then played out that feeds into a completely associated multi-facet perceptron. The last yield layer of this organisation is a bunch of hubs that recognise components of the picture (for this situation, a hub for each distinguished number). You train the organisation by utilising back-proliferation.

The utilisation of profound layers of preparing, convolutions, pooling, and a completely associated arrangement layer paved the way for different new uses of profound learning neural organizations. Notwithstanding picture preparing, CNN has been effectively applied to video acknowledgment and different assignments within normal language handling.

Example applications: image recognition, video analysis, and natural language processing.

Recurrent Neural Networks

The RNN is one of the essential organisational structures from which other profound learning designs are assembled. The essential contrast between a run-of-the-mill multi-facet organisation and an intermittent organisation is that, as opposed to totally taking care of forward associations, a repetitive organisation may have associations that criticism into earlier layers (or into a similar layer). This criticism permits RNNs to keep up with the memory of past data sources and model issues on schedule.

RNNs comprise a rich arrangement of models (we'll take a gander at one famous geography called LSTM next). The key

differentiator is criticism inside the organization, which could show itself from a secret layer, the yield layer, or some mix thereof.

RNNs can be unfurled on schedule and prepared with standard back-proliferation or by utilising a variation of back-engendering that is gotten back to spread on schedule (BPTT).

Example applications: speech recognition

During the training phase, the difference between the input and the output layer is calculated using an error function, and the weights are adjusted to minimise the error. Unlike traditional unsupervised learning techniques, where there is no data to compare the outputs against, auto encoders learn continuously using backward propagation. For this reason, auto encoders are classified as self-supervised algorithms.

Example applications: dimensionality reduction, data interpolation, and data compression and decompression.

Restricted Boltzmann Machines

However, RBMs became famous a lot later. They were initially designed by Paul Smolensky in 1986 and were known as Harmoniums.

A RBM is a 2-layered neural organization. The layers are input and secret layers. As displayed in the accompanying figure, in RBMs, each hub in a secret layer is associated with each hub in a noticeable layer. In a customary Boltzmann Machine, hubs inside the information and secret layers are additionally associated. Because of computational intricacy, hubs inside a layer are not associated with a restricted Boltzmann Machine.

During the preparation stage, RBMs ascertain the probability of appropriation of the preparation set by utilising a stochastic methodology. At the point when the preparation starts, every neuron gets

acted indiscriminately. Likewise, the model contains separate covered up and apparent inclination. While the secret inclination is utilized in the forward pass to construct the initiation, the noticeable predisposition helps in recreating the information.

Since in a RBM the reproduced input is consistently not the same as the first info, they are otherwise called generative models.

Likewise, due to the inherent arbitrariness, similar expectations bring about various yields. Indeed, this is the main distinction from an auto encoder, which is a deterministic model.

Model applications: Dimensionality decrease and cooperative separating.

Deep Belief Network

The DBN is a common organisation design, but incorporates an original preparation calculation. The DBN is a multi-facet organisation (commonly profound and including many secret layers) in which each pair of associated layers is a RBM. Along these lines, a DBN is addressed as a heap of RBMs.

In the DBN, the information layer addresses the crude tactile data sources, and each secret layer learns theoretical portrayals of this information. The yield layer, which is dealt with fairly uniquely in contrast to different layers, executes the organisation arrangement. Preparing happens in two stages: solo pretraining and managed tweaking.

In solo pretraining, each RBM is prepared to remake its contribution (for instance, the principal RBM reproduces the information layer on the primary secret layer). The following RBM is prepared comparably, but the principal stowed away layer is treated as the information (or apparent) layer, and the RBM is prepared by utilising the yields of the primary secret layer as the data sources. This interaction proceeds until each layer is pretrained. At the point when the pretraining is finished, the calibrating process starts. At this stage, the yield hubs are given names to give them meaning (what they

address with regard to the organization). Full organisation preparing is then applied by utilising either inclination plummet learning or back-engendering to finish the preparation interaction.

Model applications: Image acknowledgment, data recovery, regular language comprehension, and disappointment expectation

Deep stacking networks

The last design is the DSN, additionally called a profound curved organization. A DSN is unique in relation to conventional profound learning systems in that, in spite of the fact that it comprises a profound organization, it's really a profound arrangement of individual organizations, each with its own secret layers. This engineering is a reaction to one of the issues with profound learning, the intricacy of preparing. Each layer in a profound learning design dramatically builds the intricacy of preparing, so the DSN sees preparing not as a solitary issue but rather as a bunch of individual preparing issues.

The DSN is comprised of a bunch of modules, every one of which is a subnetwork in the general progression of the DSN. On one occasion of this engineering, three modules were made for the DSN. Every module is comprised.

How does Deep Learning work?

DL utilizes an Artificial Neural network. Fake Neural Network is much like the human mind.

Deep Learning utilizes an Artificial Neural network. Artificial Neural Network work the same as the human brain.

The human brain comprises neurons. These neurons are associated with one another. In the human mind, neuron looks something to that effect:

There are Neuron, Dendrites, and axon.

In the same way, Artificial Neural Network works.

Neurons are also in Artificial Neural Network. Which works in a similar way. Artificial Neural Network has three layers: -

- Input Layer.
- Hidden Layer.
- Output Layer.

Input Layer—First is the input layer. This layer will acknowledge the information and pass it to the rest of the network.

Hidden Layer—The second layer is known as the hidden layer. The hidden layer is possibly at least one or more in number for a neural network. In the above case, the number is 2. The hidden layer is the one that is responsible for the great exhibition and intricacy of neural networks. They play out numerous functionalities simultaneously like data transformation, automatic feature creation, and so on.

Output layer—The last sort of layer is the Output layer. The Output layer holds the outcome or the result of the issue. Pictures get passed to the information layer and we get output in the Output layer.

Neurons are depicted with the help of circles. Artificial Neural Network is completely associated with these neurons. Information is passed to the Input layer. Afterward, the input layer passes this information to the next layer, which is a hidden layer. The hidden layer follows specific operations. And further passes the output to the output layer.

This is the basic working strategy of an Artificial Neural Network.

Algorithms of Deep Learning

The most used top 5 Deep Learning Algorithms:

1. Feedforward Neural Network
2. Backpropagation
3. Convolutional Neural Network
4. Recurrent Neural Network
5. Generative Adversarial Networks (GAN)

1. Feedforward Neural Network (FNN)

Feedforward Neural Networks, as the name recommends, push estimates ahead on schedule. The Feedforward Neural Network is finished. With the utilization of neurotransmitters, every neuron is associated with different neurons. Multi-facet Perceptron is one more name for it. FNN is fit for learning non-direct connections between information focuses. There is no input system in a Feedforward Neural Network. Since it moves from the information layer to the secret layer, and afterward from the secret layer to the yield layer, in a propelling heading.

2. Backpropagation

An administered calculation is the backpropagation calculation. Feedforward neural organizations are prepared utilizing it. After the neural organization has anticipated the yield, it is contrasted with the real yield. The blunder rate is characterized as the distinction between the real and anticipated yield. The expense work is utilized to compute the slip-up rate.

The Cost capacity's recipe is as per the following:

$$\text{cost function} = 1/2 \text{ square}(y - y^{\wedge})$$

Where y is real yield and $y^{\wedge}$ is anticipated yield.

3. Convolutional Neural Network (CNN)

The Convolutional Neural Network's fundamental application regions are image recognition and natural language processing. CNN has a profound learning framework that is incredibly amazing. CNN's essential objective is to make machines that are human-like. Machines can perceive photographs of everybody similarly to people can. Accept that you see an image of a tiger and a lion. Then, at that point, you'll have the option to differentiate between the two. This is a lion, and this is a tiger, as should be obvious. This acknowledgment is cultivated by the utilisation of provisions. That infers your cerebrum focuses on explicit qualities of tigers and lions. These attributes could incorporate body structure, ears, and eyes, among others.

4. Recurrent Neural Network (RNN)

What's your opinion about Alexa and Siri's reactions to our voice orders? With the assistance of a recurrent neural network, the appropriate response is yes. John Hopfield was quick to concoct RNN in 1982. The RNN has a novel component in that it can review past input. Then, use these contributions to improve yield precision. Information on time series can likewise be anticipated utilizing RNN. Suppose you have various sorts of music put away in your music application dependent on the day. Inspirational music is played on Mondays, Romantic music is played on Tuesdays, Classical music is played on Wednesdays, etc. At the point when RNN is given this data, it can anticipate the playlist for different days dependent on the Monday playlist.

5. Generative Adversarial Networks (GAN)

The Generative Adversarial Networks (GAN) represents Generative Adversarial Network. GAN is a profound learning strategy with a great deal of solidness. Machines can make craftsmanship that is like human workmanship with the assistance of GAN. We should examine how GAN functions. There are two essential organizations in GAN:

1. Generator
2. Discriminator

The generator layer gets the information layer's qualities and endeavors to deliver a sensible yield. The Discriminator then, at that point, orders Generator's yield as genuine or counterfeit. The generator attempts to create a more precise yield dependent on the Discriminator result or yield. Backpropagation is utilized thus.

Uses of deep learning

1. Client experience

As of now, AI is being utilised by numerous organisations to upgrade the client experience. Only a few models incorporate web-based self-administration arrangements and solid work processes. There are now profound learning models

being utilised for chatbots, and as profound learning keeps on developing, we can anticipate that this should be a region where profound learning will be utilised for some organizations.

2. Translations

Although programmed machine interpretation isn't new, profound learning is helping improve programmed interpretation of text by utilising stacked organisations of neural organisations and permitting interpretations from pictures.

3. Adding shading to highly contrasting pictures and recordings

What used to be an extremely tedious interaction where people needed to add tone to high-contrast pictures and recordings by hand would now be able to be consequently finished with profound learning models.

4. Language acknowledgment

Profound learning machines are starting to separate the vernaculars of a language. A machine concludes that somebody is communicating in English and, afterward, draws in an AI that is figuring out how to tell the contrasts between vernaculars. When the rules are not really set in stone, another AI will step in that works in that specific vernacular. All of this occurs without any assistance from a human.

5. Independent vehicles

There's not only one AI model to fill in as an independent vehicle drives down the road. Some profound learning models place considerable authority on road signs, while others are prepared to perceive people on foot. As a vehicle explores not too far off, it very well may be educated by up to

millions regarding individual AI models that permit the vehicle to act.

Conclusion:

The world is looking forward to next-generation AI-based solutions across all domains. All the essentials of DL and ML are touched here. DL is an exceptionally incredible machine learning strategy. We will see more fascinating DL innovations in the coming years.

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FOG AND EDGE COMPUTING TO ACCELERATE CLOUD COMPUTING

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Computing Environments

Internet of Things (IoT) and Big data are swiftly switching how businesses set off in today's world. IoT produces data from many channels while Big data give rise to huge numbers of data. This data assembly can be scanned on a cloud environment using systematic and analytical tools. Companies are using various systematic and analytical skills and abilities to lure more and more customers and hang on to existing customers and be even more profitable. Nonetheless, the convey of huge data sets to the cloud has implications on convey rate, bandwidth and the delay between the users action among others. Present day computing models such as fog and edge computing are now coming out. Fog and edge computing lay out data processing nigh the data originating while fog and edge analytics give significant perceptions at places nigh to users. Rather than conveying all data to the cloud for processing, data can be processed nigh the origin where it is being produced. For example, not all data produced by sensors are significant. Edge analytics consequently point at differentiating between significant data and insignificant data.

Fog computing is a label made by Cisco with the aim of leading the way of cloud computing potential to the boundaries of the network. Fog computing advance and reform the cloud environments by processing data at the boundaries of networks, closer to the data origin. Fog computing does not remove or eradicate cloud computing, rather the two propositions complement each other. By processing data nigh the customer or user, latency, data conveying prices and even bandwidth can be decreased. This also unloads processing needs on the cloud. Fog computing answers the problem of frequent and regular data conveying by holding on to the data nigh to the client or customer instead of sending the data through a central server in the cloud. Rather

than using bandwidth for each device, these devices can transmit and advance on the computing capacity that is unoccupied on the local network by carrying out some job on the fog layer.

Edge computing aims at leading the way for processing nigh to the data origin without sending it to the fog or centralized system for processing.

With edge, computing and storage systems occupy at the edge as well, but as high as achievable to the part, device or application producing the data. The capacity to process data at the termination of the network layer, near to a sensor for example, further remove the need for data conveying and transmission bandwidth. Since the data is not transmitted, this also removes processing and network latency as the data is being analyzed at origin. Edge computing can in due time be judged as a combination of IoT devices, gateways, servers, workstations and mobile devices connected by networks. In this computing representation, more significance is hence given to edge devices where processing takes place. The capability of processing data and obtaining expeditious outcomes or consequences can have a huge impression for censorious applications.

Fog computing: Fog computing is a disseminate computing underpinning in which data, enumerate, storage and applications are located somewhere between the data source and the cloud. Like edge computing, fog computing brings the prevalence and power of the cloud closer to where data is created and acted upon. Many people use the terms *fog_computing* and *edge_computing* conversely because both involve bringing intelligence and deal with closer to where the data is created. This is often done to improve abundance, though it might

also be done for surveillance and obedience reasons.

Edge computing: Edge computing is a networking convictions focused on bringing computing as close to the source of data as possible in order to reduce quiescence and bandwidth use. In simpler terms, edge computing means running fewer processes in the cloud and moving those processes to local places, such as on a user's computer, an IoT device, or an edge server. Bringing estimating to the network's edge decrease the amount of long-distance communication that has to happen between a client and server.

Cloud computing: Cloud Computing is the allocation of data processing and storage services through data centers, accessed over the internet. With it, companies can ingest a series of computing services, ranging from data storage to the use of servers, is what we call the cloud. Really, the cloud is just an conceptual concept for external data storage and resources that eradicate the need for companies to have internal structures, servers, and physical data storage resources within the company. The assistance of the cloud consistently includes reduced costs, increased flexibility, reliability, scalability etc.

Applications of computing environments

Fog Computing:

- **Smart grid-** Smart grid is the next generation electric power distribution network. Smart grids contain transmission lines, substations, transformer and so forth. It uses external streams of electricity and data to create an automated and conversely robust energy distribution network.
- **Health care system** -Health care services and applications are responsive to delays and reveal confidential patient information. The generated data includes sensitive and personal data. Similarly, location data can be sensitive in certain situations.

- **Augmented reality(AR)** -Augmented Reality is the ability to make digital and virtual things fall into the real world. Augmented reality information had less latency to deliver the correct information represented by the point location and required higher information management. A slight delay in response can hurt customer skills.

- **Traffic control system** -Video camera in a traffic control system that detects flashing lights of an ambulance. Can automatically change street light and open track for vehicle to cross. Collaborate locally with intelligent street light sensors to identify the occurrence of pedestrians and cyclists and evaluate the distance and speed of oncoming vehicles.
- **Video streaming system** -Video streaming application in system fog computing allows mobile users to view the most recent video available on the screen. The role of fog computing is very important for efficient processing and quick decisions. For example a drone video stream later explained in multiple targets where the live video stream is going to the nearest node instead of being sent to a cloud application.

Edge Computing:

- **Smart cities:** The edge computing architecture is practical for utility and other public administrations controlling tools to respond to changing conditions in real time. With the increasing number of autonomous vehicles and the ever-expanding Internet of Things can smart cities change and how do individuals live and benefit from urban environments.
- **Manufacturing:** Involving data collection and enrollment in industrial equipment allows manufacturers to collect data that will better consider concept, maintainability and essentiality adequacy.
- **Healthcare:** With IoT, healthcare providers can continuously access

essential data about their patients, instead of having to interface with mediocre and fragmented databases, to deliver a robust measure of patient-generated health information.

- **Augmented reality devices:** Wearable AR gadgets like glasses and headsets are at times used to make this effect, however, most clients have encountered AR through their cell phone displays. Any individual who has messed around like Pokemon GO or used a channel on Snapchat or Instagram has utilized AR.

Cloud Computing

- **Art applications:** Cloud computing provides various art applications for designing attractive cards, booklets and images quickly and easily.
- **Business applications:** Business applications are based on cloud service providers. Today every organization needs a cloud business application to grow their business. It also ensures that business applications are available 24*7 for users.
- **Data storage and backup applications:** Cloud computing allows us to store information on the cloud and access this information using an Internet connection. Cloud providers are responsible for providing security. So they provide various backup recovery applications to retrieve lost data.
- **Education applications:** Cloud computing has become very popular in the field of education. It provides various online distance education platform and student information portal to the students. The advantage of using the cloud in education is that this robust virtual classroom talk wrapper offers ease of access, secure liter storage, measurement, greater accessibility for students, and minimal hardware requirements for applications.
- **Management applications:** Cloud computing provides various cloud management tools that help administrators manage all types of cloud activities such

as resource planning, data integration, and disaster recovery. These management tools also provide administrative control over platform applications and infrastructure.

- **Social applications:** Social cloud applications allow a large number of users to connect with each other using social networking applications such as **Facebook, Twitter, LinkedIn**, etc.

Advantages of fog computing

- **Privacy control:** With fog computing, you can better control the level of privacy. You can process and analyse sensitive data locally more than having to sending them to a centralized cloud for analysis. By keeping the process local, the IT team can monitor, track, and control any device that collects or stores data.
- **Data security:** Data security is among the most important aspects of business. Fog computing allows you to connect multiple devices to a network. More than one centralized location that may become vulnerable, activity takes place between various local endpoints, making it obvious to identify threats such as infected files, potential hacks, or malware and the threats are identified much earlier and can be contained at the device level instead of infecting or risking the whole network.
- **Increased business productivity and agility:** Fog computing helps improve productivity and increase the speed of business processes. They can allow retrieval of only those data that require immediate human interaction rather than all data, reducing the time and effort required to find the potential issues. Fog computing has to potential to save your business time and money by decreasing your IT managers' workload.

Disadvantages of fog computing

- Existing information insurance components as encryption flopped in verifying the information from the aggressors does not verify whether the user was authorized or not.

- Distributed computing security doesn't concentrate on verifying the information from unapproved get to.
- Using fog computing, a large volume of data stored on the devices themselves. These devices are often located outside the office's physical location, and many companies or business managers feel that this configuration increases the risk of a data breach or hack.
- With numerous devices and therefore numerous users, the risk for corrupted or infected files, apps, or information leaking into the company's main data stream dramatically increases. Employees probably don't use their devices specifically for work, increasing the potential risks to both the device and the company.

Advantages of edge computing

- **Speed:** Edge computing has the capability to increase network speed by reducing latency. It greatly reduces the distance it should travel by processing data closer to the source of information. Through this way the end result is the latency measured in microseconds from milliseconds. Thus, the speed, quality and the responsiveness of the overall service has been increased.
- **Reliability:** Edge computing handles reliability part very well. Since most at times the edge computing does not depend on internet connection and servers it offers an uninterruptible service. Users do not need to worry about network failures or slow internet connections. Further it can store and possess data locally by using micro data caners. Due to this a reliable connection can be assured for the IOT devices. Therefore edge computing is recommended to be used in remote locations where there is no reliable network connection.
- **Cost:** Adopting an IOT services can be costly due to their need of more network bandwidth, data storage and computational power. Using edge computing for IOT allows users to reduce the bandwidth and data storage

requirement and replace datacentres with device solutions. Thus, there is significant cost reduction in implementing IOT device and applications.

Disadvantages of Edge Computing:

Edge computing only process and analyse partial sets of information. The rest of the data's are just discarded. Due to this the companies may end up losing lots of valuable information. Therefore, before using edge computing, the organizations must decide what type of information they are willing to loose.

- **More storage space:** Edge computing does take a considerably higher storage space on your device. Since the storage devices are becoming more compact this will not actually be a problem. However it is a point to remember in when developing an IOT device.
- **Maintenance:** Unlike a centralized cloud architecture, edge computing is a distributed system. Which means that there are more various network combinations with several computing nodes. This requires higher maintenance cost than a centralized infrastructure.

Advantages of cloud computing:

- **Minimised data losses:** Cloud computing constitutes storage of data in a central server, which can be accessed anytime, anywhere. This means that when some copies of data are lost at site A due to local system failure, the data is still safe and intact at the central location. For this, companies must keep updating their data to the cloud at frequent intervals to avoid any losses in between.
- **Dumping the costly systems:** Cloud hosting allows the businessmen to expense minimum cost for the systems management. Since, we can do everything in the cloud, the local systems need not to be used or have very less to do with thus saving the pocket that was used for costly devices.

- **Pre-processed platform:** The cost of adding new person is not affected by the setup of the application, arrangement and installation for the new device. Cloud applications need not to be changed and can be used as it is, so there is no need to make changes on the platform for the new person or application to be added into it.
- **Centralization of data:** Other centralization of all the information of multiple projects and accessing data from the remote location with a single click is the most impressive assets of the cloud.

Disadvantages of cloud computing:

- **No internet no cloud:** To access cloud, an internet connection is a must. So we can say it's a big hurdle for the growth of cloud usage all over the world.
- **Security is must:** Cloud computing keeps your data secure but for maintaining the complete security, assistance from the IT firm is needed for the better experience. If the cloud is used without any proper assistance and information his/her business can become vulnerable to hackers.
- **Hard and non-negotiable agreements:** There is hard non-negotiable tie up from some of the cloud vendors for the business personnel which makes the business men think twice to use the cloud.
- **Minimum flexibility:** The application and services run on a remote server. Due to this, enterprises using cloud computing have minimal control over the functions of the software as well as hardware. The applications can never be run locally due to the remote software.

Processing Power and Storage Capabilities

Cloud computing offers high level and very advanced processing industry potential. It can store

more data storage than fog computing with limited processing. Process power and storage capacity for IoT devices and sensors compared to edge computing Less than cloud computing.

Purpose

Cloud computing is perfectly suited for long-term in-depth analysis of data and storage. fog and edge computing more suitable for quick analysis required for second and real-time response.

Conclusion:

Haze processing preferences for administrations in a few domains, such as Savvy Grid, wireless sensor networks, Internet of Things and programming characterized networks. We analyse the cutting edge and uncover some broad issues in Mist figuring including security, privacy, trust, and administration movement among Haze gadgets and among Haze and cloud. The job opportunities for cloud computing are expected to rise. The jobs in cloud computing might reach from cloud developers to operators. Every role embraces of the expertise of the cloud computing core and some domain specific skills. Scientific application is a department that is progressively used by cloud computing, systems and technologies.

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FUTURE OF CRYPTOCURRENCY

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INTRODUCTION

Cryptocurrency: A digital currency which uses a special form of cryptography. Blockchain is a technique that allows for direct transactions between businesses and individuals. These data which serves as open source and decentralized record, consists of 'blocks' of transaction data which includes the history and value of the coins. We can also say that cryptocurrency is a new type of money which can only exist in digital format.

The blocks of data are organized in a comprehensive ledger. This process is called mining. Sometimes referred to as crypto mining. Miners works to verify transactions by encryption and, once it is verified, miners add blockchain units to the ledger. In addition, creating these blocks produces number of coins. The amount will continually decrease the more coins are generated, which is what leads to cryptocurrency's rarity and value. This open-source ledger format, combined with blockchain technology, creates method for cryptocurrency ownership and verifying transaction data.

Types of Cryptocurrencies

There are more than 5000 types of cryptocurrencies like Bitcoin, Yearn Finance, Ethereum, Tether and Maker.

Bitcoin- This was the first cryptocurrency. It was created in 2009. Bitcoin is the world's largest cryptocurrency by market capitalization. There are more than 19 million tokens of Bitcoin in circulation as of Sep. 2021, against a limit of 21 million.

Bitcoin is a decentralized digital currency that we can exchange, sell and buy directly, without an intermediary. Each and every Bitcoin transaction that has ever been made exists on a public ledger

accessible to everyone and it makes transactions difficult to fake and hard to reverse. Bitcoins are not backed by the government or any issuing institution, and there's nothing to guarantee their value besides the proof baked in the heart of the system.

Since its public launch in 2009, Bitcoin has risen dramatically in value. Although it once sold for under \$150 per coin, as of March 1, 2021, one Bitcoin now sells for almost \$50,000. Because its supply is limited to 21 million coins.

Yearn Finance-Yearn.finance, is also known as "yEarn". Yearn Finance is a yield aggregating platform built on "Ethereum Blockchain". This was officially introduced on mid of July 2020. It has become one of the most valuable "decentralized finance coins".

Ethereum-Ethereum is a blockchain network. This was designed as a "programmable blockchain", This means it was created to enable the network's users to publish, monetize, create and use applications.

Tether-Tether, the first cryptocurrency marketed as a "stable coin", A breed of crypto known as "fiat-collateralized" stable coins.

The tether is designed to offer transparency, lower transaction charges and stability to users. Tether can be used by investors who want to avoid the extreme volatility of the crypto market.

Maker-Maker: The governance token of the Maker DAO and Maker Protocol a decentralized organization and a software platform, both based on the Ethereum blockchain that allows users to issue and manage the DAI stable coin.

Currencies Value in October 2021

Currency	Code	Value (INR)
Bitcoin	BTC	44,63,170
Yearn Finance	YFI	26,72,741
Ethereum	ETH	2,79,490
Tether	USDT	77.89
Maker	MKR	1,95,349



Bitcoin



Ethereum



Yearn Finance



Maker

Fig 1: Cryptocurrencies Icons.

Status of Crypto in different countries

The legal position of cryptocurrency (bitcoin) varies greatly from country to country, and many of them are still undecided or changing. While the majority of countries do not make bitcoin use illegal, its legal status as money differs, resulting in variety of regulatory ramifications. The legal status of bitcoin is determined by a number of government agencies, departments, and courts, and the restrictions and bans that apply to bitcoin are likely to apply to another cryptocurrency system as well.

- DUBAI is the first country to introduce its own cryptocurrency dubbed 'Emcash'. It is

run on its own blockchain and is utilized for a variety of government and non-government functions, including utility bills, coffee shops, and ordinary shopping. Dubai has outlawed virtual currencies such as bitcoin, but it has also developed its own cryptocurrency.

- VENEZUELA is claimed to be the second country to introduce its currency named 'Petro'. It created its virtual currency in order to gain access to foreign financing, which it is unable to do due to US sanctions.
- TUNISIA's government opted to combine blockchain technology with the eDinar and establish Monetas, a national payment system. It is utilized to pay bills and keep track of formal paperwork.

Status of crypto in India

Crypto is quickly gaining traction as an intriguing investment choice for investors in India. The number of investors has risen dramatically in recent years, and data suggests that it isn't only city slickers who are using it. The majority of its recent users are from India's small cities and villages.

Around 7 million Indians have already invested in over 1 billion in cryptocurrency, and the government faces a different problem in allowing the fintech sector to thrive in India while ensuring that it is done safely. Indian investors are eagerly awaiting the official decision on the country's cryptocurrency exchanges. Despite the fact that El Salvador has embraced the digital money revolution, India is still debating the subject.

In an online event last week, Jayant Singh, chairman of the parliament's standing committee on finance, stated that the Indian government would take a "distinctive approach" to cryptocurrency regulation. However, the future of bitcoin remains a mystery to investors.

Is cryptocurrency illegal in India?

Currently, bitcoins and other cryptocurrencies are not regulated by the Indian government. We can't declare them illegal because no central authority in the country has yet sanctioned their usage. Cryptocurrency does not fall under any norms, restrictions, or rules. This increase the danger of bitcoin and altcoin transaction because disputes stemming from these transactions will not be legally binding.

Is it valid currency in India?

It isn't a legal tender in the traditional sense, which means that you can't buy or sell anything in India using cryptocurrencies. the country's currency is legal tender, and it is backed by a sovereign guarantee. Only the Reserve Bank of India (RBI) has the authority to issue money in India.

Past of Cryptocurrency

In ancient times there was a barter system which was very inconvenient and inconsistent to determine the value of the product so it was replaced by intermediaries such as gold and silver but due to their limited stock of these precious metals, this was again not turned out to be an appropriate option so this system was replaced the government-issued currency but this option also suffered the issue inflation but while these evolutions were happening one particular theme that was going constant, was people prefer easier, convenient and transactional. So, the concept of digital cash came into existence cryptocurrency came into the picture as it is the unique and important payment invention in mankind. It is the reinvent way of exchanging money. The discovery of cryptocurrency is related to the world of the internet as if there is no global system the concept won't be possible.

By the year 2011 other competitors also appeared in the market alternatives like Litecoin altcoin also came into existence. At present there are more than thousands of cryptocurrencies are already in the market but bitcoin remains by far the leading one in terms of recognition and market cap

In the next 5 years from 2012-16, there were major curves in the growth of cryptocurrency in 2012 WordPress become the first online merchant to accept payment in the form of bitcoin. Companies like Microsoft PayPal or also accepted bitcoins. It was becoming a widely spread and internationally accepted payment method which was accepted by more than 160 merchants at that time. On November 28, 2013 bitcoin passed the \$1000 mark per coin which was remarkable progress. But there were also many setbacks that appeared with cryptocurrency the most important concern was security in Feb 2014 largest cryptocurrency mountGox was hacked. This was resulting in the account holders collectively losing nearly a million. The entire cryptocurrency market was suffered. This scandal illustrated the risk involved with cryptocurrency. With the ban of bitcoin in various countries, the threat of regulation gave pause to investors and the environmental issue were the reasons bitcoin price significantly fluctuated over a period of time.

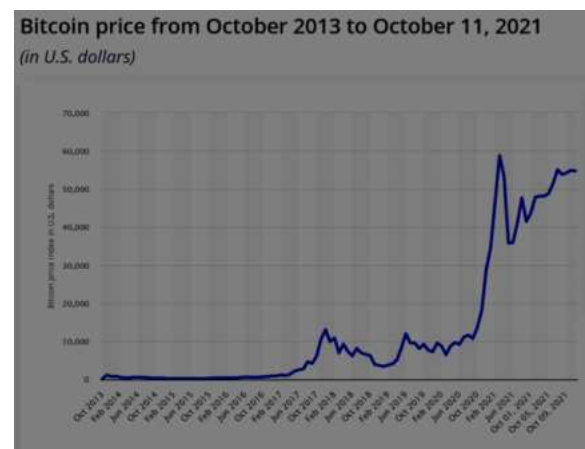


Fig 2: Bitcoin value over time

The unpredicted growth of bitcoin and of the entire cryptocurrency market started in the year 2017 where bitcoin had taken 1200 dollars which was approximately the price of an ounce of gold which is also increased to \$3000 in June 2017 and continued to rise rapidly.

In the year 2018, Bitcoin traded up to \$13,500 after the highest reach of \$19,783.06 in December of 2017. It dropped to \$3,400, which was a huge loss. That was seen at the time.

During the initial month's year of 2020, it saw a growth of almost 224% which increased further in December. In the year 2021 turned out to be the best year for other cryptocurrencies. In January, Bitcoin touched \$40,500. After Tesla invested around \$1.5 billion in Bitcoin in February that touched \$50,000 in February.

Bans on Cryptocurrencies

Cryptocurrencies like Bitcoin and Ethereum are very flexible that's why people like to invest in them. Many technologists are intrigued by the potential of blockchain technology countries are accepting the new way of exchange yet there are some countries that oppose the idea and imposed a ban on the usage of cryptocurrency.

Algeria prohibited the use of the cryptocurrency in the bypassing financial law in 2018, while Bolivia implemented a complete ban since 2014, in Columbia, the financial institution doesn't allow people to deal with this form of currency. In the year 2018, the country's ruling party of Egypt issued a religious decree which classified bitcoin as "haram" which is prohibited under Islamic laws. Countries like Thailand, Nepal, Iran & Indonesia also declared it illegal to deal with cryptocurrencies. In China, Russia outlawed the usage of cryptocurrency as China issued a warning for its citizen regarding this matter. The PBoC (People's Bank of China) is planning to launch its own digital currency which would be helpful for the government to monitor the transactions of the people, Russia also proposed legislation and law which consider cryptocurrencies as illegal and malpractice.

As for India, the situation is a little bit confusing as they are neither recognized by the government nor by RBI. At the same time there is no law that prohibits cryptocurrencies trading. Moreover in 2018, the RBI passed an order that prohibited initial bodies to accept payment in this form. So, we can keep it as an asset like gold, property.

Future of Cryptocurrency

The next decade could prove its significance in the evolution of Bitcoin. Changes within the external

financial system, there are a few areas in the Bitcoin's ecosystem where investors should take care.

Currently, cryptocurrency stands between being a value store and a daily trading platform. Institutional investors are eager to get into action and benefit from fluctuations in prices as even governments around the world, such as Japan, have announced that it is a fair way to pay for goods.

The introduction of Bitcoin (or, in that case, increases in its appeal as an asset class) as a payment method would not be possible without technological advances in its natural environment. To be considered a viable investment asset or payment method, Bitcoin's blockchain must be able to manage millions of transactions in a short period of time. Several technologies, such as the Lightning Network, promise scale on its performance. New cryptocurrencies have been developed as a result of the complex forks of the bitcoin blockchain, including Bitcoin Cash and Bitcoin Gold, which aim to adjust ecosystem parameters so that they can manage more transactions at a faster pace.

Conclusion

There are more bitcoin groups and communities than any other cryptocurrency. We don't need to follow advice from these but there will be people who are part of the cryptocurrency community having a great deal of experience in Bitcoin Investment. There are many places that buy and sell Bitcoin more than any other cryptocurrency. Bitcoin is a payment system based on a redesigned architecture that provides a file for how to get more anonymous credentials, bitcoin addresses, can be used to make and receive payments. The long-held view of bitcoin is that it is the subject of much debate. Making Bitcoin requires ingenuity, patience, and most importantly, a lot of power. After all, the basic rules enshrined in the Bitcoin constitution ultimately take the technology. That's why Silicon Valley has had a hard time understanding the value proposition of Bitcoin, not just technology, financial instrument, or consumer request; an entire technology-backed financial system. Changing the constitution of Bitcoin requires a political process that can break its financial structures; therefore, new technologies are being used as modules. Bitcoin is a digital novel that has the

potential to be a key player in micropayment markets and global markets. It is also a good alternative to gold bugs who prefer to hold funds that are fully funded by assets. Because they are anonymous and, in their hands, it is therefore difficult to shut them down, it can allow organizations that are hated by the government, whether they are praiseworthy or disgusting organizations - to be funded without the risk of money laundering or sanctions against donors

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“The best way to predict the future is to invent it”

HAPTIC TECHNOLOGY

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INTRODUCTION

The word haptic comes from the Greek term haptēsthai, which implies "to touch or to feel." The "science of adapting tactile experience to human interaction with computers" is referred to as haptic. It allows for manual interaction with a real-world, virtual, and as well as distant environment. Haptics allow you to feel and manipulate three-dimensional virtual objects in terms of shape, weight, surface textures, and temperature.

In our article, we explain basic concepts of haptic technology and its various applications in different fields such as medical, education, training and in military field. Different haptic devices used across the world are also discussed.

Haptic technology

Upcoming virtual reality experiences and daily consumer electronics have both integrated haptics. Haptic technology, also termed as kinesthetic communication or 3D touch, is any technology that can give the user a tactile sensation by exerting forces, oscillations, or movements.

Haptic is the science of touch. It's how we interface with world in many aspects and ultra haptics is about how we create that sense of touch in thin air so we can create buttons and sliders and switches or even virtual objects that you can touch but they really don't exist

How does haptic work?

Haptic technology works by using ultrasonic transducers an array of them where we can change the amplitude and phase of every transducers individually which means that we can bring all the sound waves to a single point at the same time which creates a high pressure level that feels on your skin.

Now the skin can't response to ultrasonics it only responds to frequencies of 0 to 500 Hertz so we modulate the ultrasonics at a frequency around 2 to 400 Hertz which creates a sensation of touch.

Now if you touch a surface you don't feel anything but if you slide your hand across it you can feel the texture of that simply by the vibrations that come off that material. Haptic technology recreates this midair by modulating the ultrasonic technology.

So it allows us to create not only the sense of touch but a sense of texture and able to recreate objects that you wouldn't normally able to recreate.

History of haptics-

The term haptics was coined by scientists to describe a subject of research that focused on human touch-based perception and manipulation.

Research efforts in a completely new sector, robotics, began to focus on manipulation and perception via touch in the 1970s and 1980s, constructing a dexterous robots hand. In the early 1990s, a new definition for the term haptics emerged. Virtualized haptics, or computer haptics, was made possible by the convergence of numerous developing technologies.

In the 1970s, haptic technologies were invented and implemented, and most people have undoubtedly experienced some type of haptic feedback in video games with motion response.

Haptic devices-

Haptic devices (also known as haptic interfaces) are mechanical devices that allow a user to communicate with a computer. In virtual environments and tele-operated systems, haptic devices allow users to touch, feel, and manipulate three-dimensional objects.

Haptic devices capture a user's physical manipulations (input) and deliver realistic touch sensations that are synchronised with on-screen events (output). Consumer peripherals are examples of haptic gadgets devices with unique sensors and motors, such as joysticks with force feedback, steering wheels, and more complicated devices designed for industrial, medical or scientific applications like PHANTOM device.

Phantom desktop

A desktop haptic device is a multi-joint robotic arm with a pen held in the user's hand. The device can track the stylus' movement and provide force feedback on it. Normally, the device is placed on a tabletop or on the ground.

Haptic glove

A haptic glove is a common example of wearable haptic technology. Its main features include multi-degree-of-freedom whole-hand motion tracking and distributed force and tactile feedback to the fingertips and palm. Haptic gloves use the skillful manipulation and responsive interpretation capabilities of our hands to allow users to touch and modify remote or virtual objects in an instinctive and direct manner.



Fig 2. Haptx glove

Haptic rendering

The process of computing and creating forces in response to user interactions with virtual objects

is referred to as haptic rendering[4]. The process of calculating the feeling of touch, particularly force, is known as this. It entails sampling the haptic device's position sensors to determine the user's position within the virtual environment. The received position data is utilised to see if there are any collisions between the user and any virtual environment objects. In the event of a collision, the haptic rendering module will calculate the necessary feedback forces, which will then be applied to the user via the actuators.

Applications

The developing discipline of haptics has a lot of potential in the future; the technology has gotten a lot of attention recently. This new technology is being used in vast scientific and designing areas creating a new sense of touch and providing a virtual 3D environment to its users. Vibrations from phones and game controllers are common examples, but alternate means such as sound waves and wind can also be used to produce tactile feedback.

Education

In education, haptic is used to make learning more exciting and simple. Haptics is used in medical, training, chemistry, molecule manipulation, physics, and engineering, among other fields. The use of haptics in medical training provides hands-on training for medical students.

Gaming

The implementation of haptics in the gaming sector is a huge eye-catcher. The gaming experience can be rendered genuine by constructing a suit, glove, or other sensor that is appropriate for the game.

Military

Haptic technology has been adopted in the military for a long time. In the military, haptics are used in several simulations.

Medical

With the use of haptics, a doctor in a remote location can operate on a patient with high accuracy utilizing a 3D video and haptic-controlled robotic arm. This can be executed, and the procedure can be performed without the presence of a doctor.

Haptic is utilized in the medical field to help medical students better understand human body components. It enables doctors to train more effectively.

Cell Phones

Material Haptic feedback is having the opportunity to be essential in cell contraptions. Handset creators remembering particular kinds of haptic advancements for their contraptions all things considered, this takes the sign of vibration response to contact. High Electronics uses a haptic feedback innovation named in addition to address an extensive part of their touch-screen auto course and sound system units. The Nexus One tricks haptic feedback, as shown by their judgments.

Art and design

Haptics are used as a piece of virtual expressions for instance, sound mix or visual computerization and activity. The haptic device allows the expert to have prompt contact with a virtual instrument that makes consistent sound or pictures. The expansion of a fiddle string, for example, produces consistent oscillations of the string under the strength and intensity of the craftsman's bow (haptic device).

CONCLUSION

We conclude that haptic technology is the only approach that can enable a wide range of interaction that VR technology cannot. Haptics is an emerging and in-demand technology in both the medical and

educational fields. This technology will help soldiers train more effectively and decrease harm in the military. No one needs to go outside for training; they can receive the same sensation by practising on a simulator with haptics. Haptic has completely transformed the gaming industry. The haptic device functions as both an input and output device, monitoring human physical movements as an input and giving realistic touch experiences as an output, both of which are coordinated with display events. Haptic devices and effects evolve and become more realistic as technology and computer power improve.

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HUMAN COMPUTER INTERACTION

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INTRODUCTION

Usability is the activity and study of human-computer interaction. It's about the interaction between a human and a machine, their mutual understandings, and developing software that would make a human's job easier and that people would want to use. It might also be described as a study of how people use technology. Computers are being used to execute certain jobs, and they are being used in such a way that the interaction is both enjoyable and effective. As a result, As the name implies, it is made up of three components: the user, the computer, and their interaction. It entails the drawing of Low and high fidelity refer to the degree of precision with which a thing is reproduced. The first step in becoming intelligent is to become aware of your surroundings. The growth of computer technology has given rise to the concept of human-computer interaction. The youthful age group of people who are educated and technically savvy is involved in research studies in human computer interaction. The mental model in Human-Computer Interaction is the topic of this paper. This review study takes many methods, one of which is to highlight current methodologies, findings, and trends in human-computer interaction, and the other is to identify research that was invented a long time ago but is currently lagging behind. This study also focuses on a user's emotional intelligence in order to make them more user-friendly and reliable.

Keywords— Human computer interaction, Mental model, emotional intelligence, user-friendly, reliable.

Various Types of HCI Design Approaches

1. HUMAN

The HCI product is created and used by the product's users, who are people. in order to comprehend Humans as an information-processing system, how they communicate, and human/user characteristics as a processor of information

Memory, attention, problem-solving, learning, motivation, physical abilities, conceptual models, and diversity are all examples of information. Interaction, communication, and language - Linguistic features such as syntax, pragmatics, semantics, conversational interaction, and specialised languages. Anthropometrics is the systematic measuring of human physical attributes such as dimensional descriptors of body size and shape, as well as physiological parameters and their relationships.

2. COMPUTERS

Because computers have unique components that can communicate with users, they are employed for user interaction. Computers also give a platform for users to formulate and interact with components, resulting in effective learning. Computers excel in "simple and highly defined tasks," such as counting and measuring, accurate storage and recall, swift and consistent answers, data processing or calculation, formulations, repetitive activities, and performance over time.

3. Mental Model

Mental Models are the most essential notions in human-computer interactions. These mental models are what a user believes about the systems in question, and they are founded on beliefs rather than facts. Users make predictions based on the mental model and subsequently take action based on their predictions. Each user's brain has its own mental model. The mental models are in flux, meaning they flow out as they are inserted into the brain rather than being fixed in a medium.

The Perplexing Mental Model —

Because many users have not established a model of their screen functions, these models confuse distinct portions of the system. The design team and the user have distinct mental models, so while producing something for them, it's important to keep that in mind.

Odds ratio, sensitivity and specificity at various cut-off value of HCI

HCI(cut-off)	Sensitivity (%)	Specificity (%)
200	64	80
300	72	80
400	72	68
500	76	56
600	80	52

HCL DESIGN PROCESS

Ebert outlined three human-computer interaction design principles that can be used to create user-friendly, systematic, and instinctive user experiences.

In a single user interface design, one or more techniques can be employed. The three ways to developing a user interface are as follows:

1. **Anthropomorphic Approach:** This approach entails designing a human interface with human-like qualities.
2. **Cognitive Approach:** This method is used to create a user interface that helps the end user and takes into account the brain's and sensory recognition abilities.
3. **Empirical Approach:** This method is used to examine and compare the usability of different options.

EXISTING HCI TECHNOLOGIES

HCI design should take into account a wide range of human behaviours and be practical. When compared to the simplicity of the interaction method itself, the degree of human involvement in connection with a computer is sometimes imperceptible. The current

situation. The degree of complexity varies amongst interfaces, both in terms of usefulness and usability, as well as the machine's financial and economic aspects on the market. For instance, consider an electrical system. Because the only function of a kettle is to heat water, it doesn't need to have a complicated interface. Furthermore, having an interface that is more than a thermostatic on/off would not be cost-effective. A simple we, on the other hand.

As a result, when designing HCI, the amount of interaction a user has with a machine should be carefully considered. There are three levels of user activity: physical, cognitive, and affective. The physical aspect

establishes the mechanics of human-computer interaction, whereas the cognitive aspect addresses how users can comprehend and participate with the system. The emotive aspect is a more recent concern, and it aims to affect the user in such a way that they continue to use the computer by influencing attitudes and emotions toward the user. The primary focus of this paper is on advances in the physical aspects of interaction.

INTERACTION

The skillsets on the list are relatively complementary. It is the process of a computer and a human interacting to produce a useful product. An interaction between a user and a computer is a two-way process.

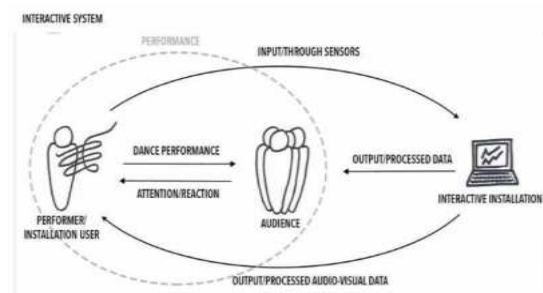


Fig. 1. Interaction between human and computer

INTELLIGENT AND ADAPTIVE HCI

Although the bulk of the public's gadgets are still simple command/action setups utilising less

sophisticated physical apparatus, the flow of research is focused on the development of intelligent and adaptive interfaces. The precise theoretical meaning of intelligence or being smart is unknown or, at the very least, not publicly acceptable. However, the apparent increase and improvement in functionality and usefulness of new technologies on the market can be used to describe these ideas. Differentiating between employing intelligence in the creation of the interface (Intelligent HCI) and the way the interface interacts with users (Adaptive HCI) is a key aspect in the next generation of interfaces. Intelligent HCI designs are interfaces that are intuitive to use. At the very least, infuse intelligence into user perception and/or response. A Speech-enabled interfaces that communicate with the user using natural language are only a few examples. user and gadgets that visually track and respond to the user's movements or gaze correspondingly.

Adaptive HCI designs, on the other hand, may not use intelligence in the interface design but do so in the way they interact with users in the future. An example of adaptable HCI is a website that sells numerous things using a standard GUI.

CONCLUSION

HCI is most likely to become the AI (Artificial Intelligence) research community's sole truly worldwide study issue. The world could be changed forever if a breakthrough in HCI design is made.

Many parts of HCI technology are concerned with more in-depth interpretations of human behaviour. HCI will have a huge impact. The world is changing. Because human-computer interaction is based on interactions between humans and computers, It would be chosen since it is simple to use and is completely reliant on humans/users and works with them. Instructions. People's work will be made easier in the future if they do a tiny amount of effort in this field.

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"Technology is the campfire around which we tell our stories."

VIRTUAL DISPERSIVE NETWORK

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INTRODUCTION

Data that was once securely encrypted would now be able to be broken by parallel processing power. SSL and Virtual Private Networks can't generally ensure messages as they traverse intermediary pathways. In this way, Virtual Dispersive Networking comes into play. VDN takes a page out of the traditional military radio spread spectrum security approaches. Though radios turn through the frequencies arbitrarily, they divide and part every piece of correspondence traffic into the different streams.

What is MIM attack?

In the Cybersecurity World, a person in the middle of an attack (MIM) is an associated attack during which the offender enters the centre of a network path tacitly, as if the sender and receiver are unable to capture and believe that they're directly leading communication with one another. One example of an associated MIM attack is active eavesdropping. In this case, the offender might stick with a bit of package somewhere within the network path and capture all the relevant network traffic for later analysis. The offender will capture all the relevant messages passing between the two victims and rigorously monitor and replace recent ones or inject new ones. It is often troublesome and issues arise within the organization.

What about using SSL and Virtual Private Networks?

SSL and Virtual Private Networks (VPN) do not always protect messages as they travel across intermediary pathways, which is why Virtual Dispersive Networking was developed.

Why Virtual Dispersive Networking?

Cyber-attacks are serious problems for large enterprises. They can compromise the security of their data and also make it difficult to transfer data efficiently and at a low cost. In fact, security attacks cost every company around 12.7 million dollars annually. Previously, the data was sent on an individual stream, which was vulnerable as it was very easy for men to be in the middle threat. So the Virtual Dispersive Networking came.

Incomparable Security: Distributing data over various streams eliminates the MITM threat. Hackers can only access a piece of original information from any given stream, providing any data that is found to be unimportant and virtually unencrypted.

Network Stabilization: Assume that a connection to any stream is lost due to network failure, and that data packets are redirected to an existing route or an additional path is established, resulting in minimal network downtime.

Speed/Performance: As data flows from multiple independent streams using unique approaches, it increases available bandwidth and improves the flow of data to each stream. As a result, the speed and performance are boosted..

Overall, VDN's are revolutionary because they help prevent attacks on data and efficiently encrypt it, which also helps companies save millions of dollars each year from having cyber security attacks. Since privacy is the major concern in today's society, it helps organisations reduce costs, secure operations, and perform more efficiently dispersed technologies, transforming the internet and the way organisations use it.

Benefits to Dispersive Virtual Network: -

Performance: - The performance of a network is enhanced because a Dispersive Virtual Network divides the traffic on the network into different independent packet streams. Each packet stream is sent to a different individual encrypted path.

Security:- Security on the network is increased as the Dispersive Virtual Network distributes traffic across multiple changing pathways to avoid DoS, DDoS, and Man-in-the-middle attacks. Each packet stream is encrypted with a different AES-GCM-256 key.

Bandwidth:- It creates one large, logical pipe that aggregates and utilises all your connections. Broadband, MPLS, LTE, Wi-Fi, etc. This enables you to maximise your bandwidth utilisation across all connections.

Reliability: - To optimise the connectivity, the Dispersive Virtual Network rolls streams over to new paths when a degraded path is detected.

How VDN works?

VDN follows the ways of ancient military radio to unfold spectrum security. Radios rotate through the frequencies indiscriminately, and communications are divided into multiple items. VDN divides the initial message into multiple streams and encrypts every element one by one, routing them over several servers, computers, and mobile phones. At the same time, the info moves out dynamically to optimum streams, each randomising the streams the messages take while at the same time taking into account the network problems. Once it involves the hackers, they're left to seek out information elements as they are going through, like information hubs, the cloud, the Internet, and so on.

Disadvantages of VDN

Virtual server sprawl: Although one of the key goals of server virtualization is to limit the quantity

of physical servers, it usually leads to having additional virtual servers than had been deployed previously. As the variety of VMs will increase, the elements within the IT system notably storage and networking are suffering from the extra capability.

Resource rivalry: - Although admins will make resource allocation changes to every virtual server, if one of those VMs is overtaxed, it will have an effect on others running on a constant physical server. If rivalry for resources like central processing unit cycles, memory, and information measures could be a persistent drawback, additional powerful hardware may be needed to host multiple VMs at the same time.

Conclusion

Today's government is largely centralised in dispersed technology, primarily banking and other utilities. It also forays into commercial industries. Cloud computing gives many opportunities for dispersive technology. The cloud can be able to set up secure communication between clouds and on-premises information. Dispersive technology has replaced VPNs, improving the security and management of hybrid clouds as well as private clouds. As in the IT industry, it is frightening to make changes because of sensitive data, but if an organisation is aware of this, they can begin implementing some of these security technologies without worrying about the future.

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VIRTUAL REALITY

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INTRODUCTION

Being in between the mountains without stepping out, being in a world that is a creation of someone's imagination, or being in a game with your favourite players, sounds fantastic. All of this is possible today using VIRTUAL REALITY. Virtual reality (VR) uses computer modelling and simulation, which helps a human being interact with virtual and artificial three-dimensional visuals and effects and have a sense that they are actually there. VR applications plunge the user into a computer-generated setup that simulates reality through the use of interactive devices that send and receive information and are worn as goggles, headsets, gloves, or body suits [1]. It is a term which shows, by its name, that the three-dimensional scenario or world that it is not real. It is a type of technology that is used to understand and experience the real-life environment. VR has evolved a lot in this era. A virtual reality is not possible with 3D effects because, in addition to the 3D effects, you believe (when you actually feel as if you are in a different world) and interact (when you move around, the VR should move with you).

TYPES OF VIRTUAL REALITY

There are different types of the Virtual reality which are given below:

1. Fully Immersive

It is defined as when a person can feel the complete VR experience, which includes a perfect venue or a place to explore. Secondly, a good computer that can detect where we are going and run that effect accordingly, and last but not least, it is required to have a great sound room that can experience the VR in a real way. This type of VR is frequently used for gaming and other distraction purposes in VR arcades or even at home (unfilled, non-fragile room recommended).

2. Non immersive

It is also a type of VR, but not in its full effect or feel. Some people do not enjoy the fully immersive experience, so an architect can create a non-immersive VR technology that can be experienced with a wide screen and headphones; it is not as realistic, but it comes close.

3. Augmented Reality

It is that type of VR where there is no physical appearance of the character, but it is present in the particular location with the help of a machine. Suppose someone is trying to know the interior design of their home so they can create virtual things like beds, tables, etc. with the help of a mobile screen. It is a unique form of Virtual Reality.

VR DEVICES

Many devices have been launched using the virtual reality concept, but the first device was purchased by Facebook for 3 billion USD, which was a virtual reality headset. And after many companies came into the race, like Microsoft, Sony, etc., there are different types of VR devices we have at this time. Some of the devices are given below:

1. Oculus Rift

This is one of the most common devices for VR. It provides a high view field and works best in a virtual experience. This was first launched in 2006 and is now becoming the most highly rated product all over the world. Oculus Rift is upgrading its version and launching a new product of their device where a person's hand works as a remote control.

2. HTC Vive

It can have a self-control tracking system that can provide a very high resolution display compared to others. The HTC Vive provides you with a swappable

display for better features. The sensor tracking gives you a great and expansive experience. It can give you a more flexible and better environment.

3. **Rec Room**

It is a social game with a diverse set of features that is available for free. It is one of the social hubs that offers you a doorway to a limitless set of possibilities. It can include different types of games, like mini-adventures, paintball games, etc.

4. **Valve Index**

It is one of the popular devices that can become famous in a very short period of time. It is just like a glove that can sense all your fingers. It is not only designed with the futuristic controller but also with the high-quality headset. This is a lighthouse box, so you have to do a room setup for this.

APPLICATION OF VR

There are so many applications of the virtual reality some of them are given below:

1. **VR in Education Sector**

This is one of the best applications of virtual reality. Adding virtual reality to the education system can increase the curiosity in children towards education, where a student can learn things in a three-dimensional environment. If someone wants to learn social skills for children, then it is an ideal way to learn things.

2. **VR in Cinema**

This is a very popular and commonly used type of application. Virtual reality is used very widely in the cinema. In this type, the various cinema halls have different types of headphones and music systems, which can give you a different experience of virtual reality. Some of the halls are designed by their systems in such a way that you feel like you're a character in a movie.

3. **Medical**

Many institutions have started using VR in medical training. For example, before performing any anatomical procedure on a real person, they first learn it through wearing VR

headsets, which allows them to interact with the human body in a 3D format.

4. **Classroom Education**

In schools too, teachers and educators are now using VR to enhance students' learning experiences. Film & Entertainment: The first movies were just 2D pictures, then they turned into 3D images. Now people can be a part of it.

5. **Tourism**

By using VR, travel agents now have a chance to convince their customers more by showing them destinations in a better way than brochures. Thomas Cook used virtual reality for the same, and this resulted in a 190% uplift in New York excursion bookings.

6. **Sports**

It helps to train athletes for real competition, and even VR has evolved as a booming technology.

7. **Gaming**

Enhances the gaming experience provides real world environment to boost gaming experience. Both gaming and VR are directly proportional to each other

ADVANTAGES OF VIRTUAL REALITY

In this era, the scope and popularity of virtual reality have been increasing day by day. It also has so many advantages in today's world.

1. Virtual reality has given us an experience of that realm where we can feel that it is happening in the real world.
2. Virtual reality is very useful for a person to practise and train, just like for a doctor, it can help to practise their surgery. For a pilot, it can help to practise in their plane.
3. It can also be helpful to experience the virtual tour of a particular place if the person is not capable of going there.
4. With the help of VR it gives it in a very handy manner. Suppose you are going for your interior design work, so that the person can show you the best possible

scenario and look for your home with the help of VR.

5. Virtual reality creates a realistic world.
6. Through Virtual Reality, users can experiment with an artificial environment.
7. It assists with conquering. Language Barriers: Language Hindrance is a huge issue in the field of education. The use of Virtual Reality allows the execution of any language to be carried out correctly.
8. Helps in tourism: Considering the popularity of services like Google Street View today, it is not difficult to predict that visualisation of upcoming trips will be in high demand [2].

DISADVANTAGES OF VIRTUAL REALITY

Where there is so many advantages of the VR there are some disadvantages also which we are discuss below:

1. Virtual Reality doesn't offer flexibility in making changes to the already program set, suppose someone in the class wants to raise a query so in the real world they are free to do but in a VR world it can't be done.
2. Some of the Virtual Reality is just like a addiction to a person which is not good for their mental or physical health.
3. One of the rare disadvantage of the VR is that its is very costly in price so that not everyone can effort it to experience.
4. Once a person is enjoying in the VR world so badly then they are so far from the real world and cannot enjoy as much.
5. Needs Flexibility: In the homeroom you can act with adaptability. You are available to give ideas and pose inquiries. This is preposterous with computer generated reality
6. Inadequate Human Connections: Virtual Reality accompanies the arrangement of weaknesses. The traditional training

framework is chiefly founded on relational associations and the degree of individual human correspondence.

7. Illusions can be broken easily.
8. Hygiene is also a issue, as headsets can make users and sweat and sharing such headsets make spread infections

CONCLUSIONS

Finally, after knowing all the topics and scenario of the virtual Reality we can now discuss all the topic in a concluded manner. Virtual Reality is a that type pf realm which can provide a virtual environment where a person can feel that they are at the same time or the same place and experience that thing. It is a 3d environment which create a realistic environment for a person. Virtual reality is moving at a faster speed towards the modern era of development. The effects of using virtual reality is outstanding. The different VR devices enables users to experience environment in a different dimension other than 2d , 3d etc. Virtual reality is one of the most innovative yet subtle technological advances out there. VR has captured the attention of every enthusiast out there. From kids to boomers, everyone wants to take the VR headsets for a spin. Although it brings along a few risks like privacy and reduced cognition among kids, VR has been a tremendous success and has managed to stand among the multi-million dollar industries. From gaming to mocking an operation theatre for students of Health practice, VR stood its ground. Minimal software or hardware requirements make it one of the most feasible technologies to invest into. The humankind has discovered many technologies and devices in Virtual Reality but there is whole depth of ocean need to be discovered.

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ABOUT DEPARTMENT OF INFORMATION TECHNOLOGY

Vision

To be a department of excellence in technical education, widely known for the development of competent and socially responsible IT professionals, entrepreneurs and researchers.

Mission

- ✓ To impart established and contemporary technical knowledge.
- ✓ To synchronize concepts, logic and skills for effective decision making.
- ✓ To encourage entrepreneurial environment and nurture innovative ideas.
- ✓ To foster research and provide consultancy service to the corporate.
- ✓ To utilize technical knowledge of students towards social issues through various group activities and events.

Programme Educational Objectives

- ✓ Exhibit professional competencies and knowledge for being a successful technocrat.
- ✓ Adopt creative and innovative practices to solve real-life complex problems.
- ✓ Be a lifelong learner and contribute effectively to the betterment of the society.
- ✓ Be effective and inspiring leader for fellow professionals and face the challenges of the rapidly changing multi-dimension, contemporary world.

Programme Outcome

- ✓ Demonstrate competencies in fundamentals of computing, computing specialization, mathematics and domain knowledge suitable for the computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements.
- ✓ Design efficient solutions for complex, real-world problems to design systems, components or processes that meet the specifications with suitable consideration to public health, safety, cultural, societal and environmental considerations.
- ✓ Ability to engage in independent learning for continuous self-development as a computing professional.
- ✓ Ability to effectively communicate with the technical community and with the society at large about complex computing activities by being able to understand and write effective reports, design documentation, make effective presentations with the capability of giving and taking clear instructions.
- ✓ Ability to work in multi-disciplinary team collaboration both as a member and leader, as per need.
- ✓ Ability to apply innovation to track a suitable opportunity to create value and wealth for the betterment of the individual and society at large.
- ✓ Ability to recognize and assess societal, environmental, health, safety, legal and cultural issues within local and global contexts and the consequential responsibilities applicable to professional computing practices.
- ✓ Ability to apply knowledge and understanding of the computing and management principles and apply these to one's own work, as a member and leader in a team, to manage projects in multidisciplinary environments.
- ✓ Ability to perform professional practices in an ethical way, keeping in the mind cyber regulations & laws, responsibilities and norms of professional computing practices.
- ✓ Ability to research, analyze and investigate complex computing problems through design of experiments, analysis and interpretation of data and synthesis of the information to arrive at valid conclusions.
- ✓ Identify, formulate and analyze complex real-life problems in order to arrive at computationally viable conclusions using fundamentals of mathematics, computer sciences, management and relevant domain disciplines.
- ✓ Create, select, adapt and apply appropriate technologies and tools to a wide range of computational activities while understanding their limitations.



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