



Baghel
Institute

Internet of Things



Internet of Things

- The Internet of Things (IoT) describes the network of physical objects—“things”—that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems over the internet.
- The ability to transfer data over a network without requiring human-to-human or human-to-computer interaction.
- IoT developed by Kevin Ashton,
- IT is an advanced automation and analytics system which deal with artificial intelligence, Sensor, networking, electronic cloud, messaging, etc. To deliver complete system for the product or services the system created by IoT has greater transparency control and performance.



How does internet of things work?

SENSOR:- A sensor is a device that measures physical input from its environment and converts it into data that can be interpreted by either a human or a machine.

CONNECTIVITY:- The communication enable messaging from devices all the data collected is sent to a cloud infrastructure where devices connect to the cloud to perform different operations.

DATA PROCESSING:-Once the data is collected and it gets to the cloud, the software performs processing on the gathered data.

USER INTERFACE:- The user interface consists of the features by which a user interacts with a computer system. This includes screens, pages, buttons, icons, forms, etc. The most obvious examples of user interfaces are softwares and applications on computers and smartphones.

How IoT Works?

Sensors

Collecting data



Connectivity

Sending data to cloud



Data processing

Making data useful



User interface

Delivering information to user



The IoT architecture generally comprises of these four stages.

Sensor /actuator:- A thing in the context of Internet of Things should be equipped with sensor and actuators, thus giving the ability to emit, accept and process signals.

Data Acquisition Systems: The data from the sensors starts in analogue form which needs to be aggregated and converted into digital streams for further processing. Data acquisition systems perform these data aggregation and conversion functions.

Edge Analytics: Once IoT data has been digitized and aggregated, it may require further processing before it enters the data centre, this is where Edge Analytics comes in.

Cloud Analytics: Data that needs more indepth processing gets forwarded to physical data centres or cloud-based systems.

Major components of IOT

IoT is a network of smart devices, sensors, and actuators that can interconnect with each other.

The major components of IoT devices are:

1. Devices and Sensors
2. Networks
3. Intelligent Actions
4. Intelligent Analysis

Advantages of IOT

- High Security
- All Over The Uses Of Money Is Less
- Time Efficient
- Easily Accessible
- High Accuracy
- Diligence
- Proper Records Can Be Maintained

Disdvantage of IOT

- Security Issues
- Privacy Concern
- Increased Unemployment
- The Complexity Of The System
- High Chances Of The Entire System Getting Corrupted
- High Dependency On The Internet
- Reduced Mental And Physical Activity
- Need Power Backup Everytime

Application of IOT

Internet of Things Uses By Industry

 **HOME**
• Smart Temperature Control
• Optimized Energy Use

 **INDUSTRIAL**
• Machine-to-Machine Communication
• Quality Control

 **AUTOMOTIVE**
• Vehicle Auto-Diagnosis
• Optimized Traffic Flow
• Smart Parking

 **AGRICULTURE**
• Offspring Care
• Crop Management
• Soil Analysis



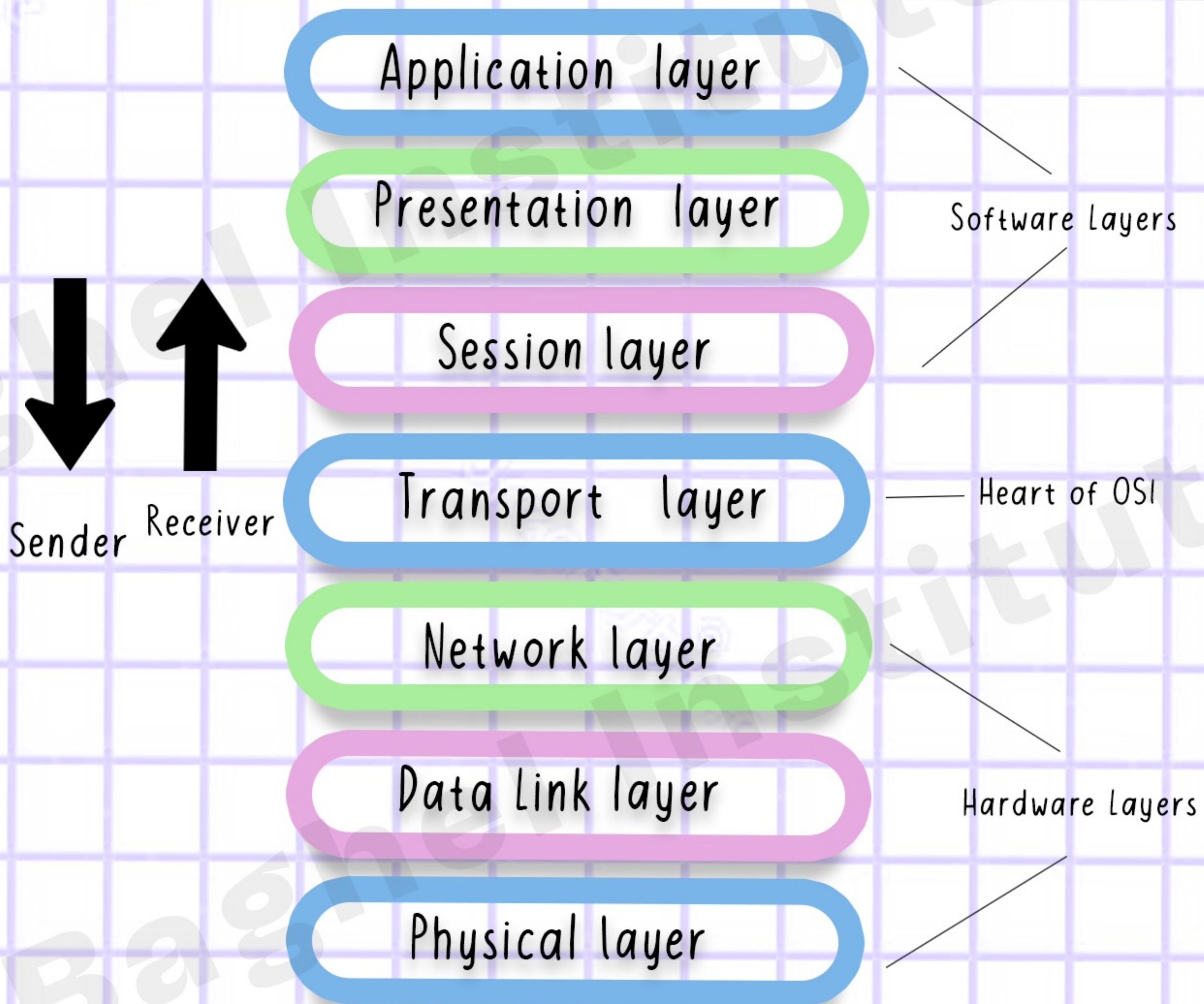
 **MILITARY**
• Situational Awareness
• Threat Analysis

 **MEDICAL**
• Optimized Patient Care
• Wearable Fitness Devices
• Quality Data Reporting

 **ENVIRONMENTAL**
• Forest Fire Detection
• Species Tracking
• Weather Prediction

 **RETAIL**
• Theft Protection
• Inventory Control
• Focused Marketing

OSI Model



Physical Layer (Layer 1) :

The lowest layer of the OSI reference model is the physical layer. It is responsible for the actual physical connection between the devices.

Data Link Layer (DLL) (Layer 2) :

The data link layer is responsible for the node-to-node delivery of the message.

Network Layer (Layer 3) :

The network layer works for the transmission of data from one host to the other located in different networks.

Transport Layer (Layer 4) :

The transport layer provides services to the application layer and takes services from the network layer.

Session Layer (Layer 5) :

This layer is responsible for the establishment of connection, maintenance of sessions, authentication, and also ensures security.

Presentation Layer (Layer 6):

The presentation layer is also called the Translation layer. The data from the application layer is extracted here and manipulated as per the required format to transmit over the network.

Application Layer (Layer 7) :

At the very top of the OSI Reference Model stack of layers, we find the Application layer which is implemented by the network applications.

Big Data Analytics

In big data analytics, we are presented with the data. The process of converting large amounts of unstructured raw data, retrieved from different sources to a data product useful for organizations forms the core of Big Data Analytics.



Types of Big Data Analytics

Prescriptive Analytics

The most valuable and most underused big data analytics technique, prescriptive analytics gives you a laser-like focus to answer a specific question. It helps to determine the best solution among a variety of choices given.

Diagnostic Analytics Diagnostic analytics looks for the root cause of a problem. It is used to determine what happened. This type attempts to find and understand the causes of events and behaviours.

Descriptive analytics

It is the process of using current and historical data to identify trends and relationships. It's sometimes called the simplest form of data analysis because it describes trends and relationships but doesn't dig deeper.



Predictive Analytics

The most commonly used technique; predictive analytics use models to forecast what might happen in specific scenarios. Examples of predictive analytics include next best offers, churn risk and renewal risk analysis.

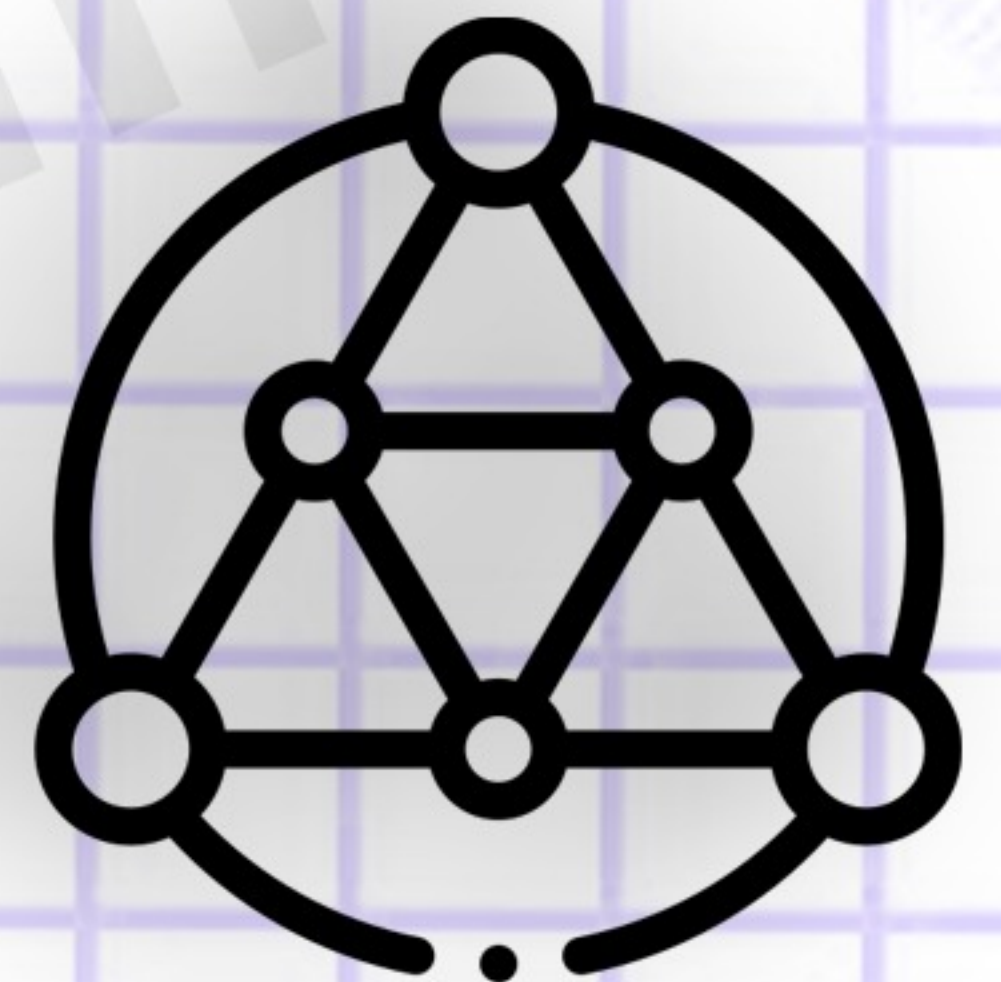
Characteristic of Big Data Analytics

Velocity: The rapid generation of data from time to time is called velocity.

The data may be real time data, near real time data, yearly data, monthly data, hourly data, historical data and weekly data and so on.



Complexity: Today's data comes from multiple sources. And it is still an undertaking to link, match, cleanse and transform data across systems. However, it is necessary to connect and correlate relationships, hierarchies and multiple data linkages or your data can quickly spiral out of control.



Variety: The types of data used to store in big data are called variety. The types may be text, click stream, web logs, video, images, audio, animation, legacy documents and sensor data and so on.

Value: It includes how we can use this big data for enhancing the business and living style. We know that different types of business or social application generate different types of data and we still identifying values form Big Data in their application areas is a big issue.

Advantage of Big Data

- Save time.
- Save money.
- Prediction can be done.
- Good product and service can be created.
- One platform carry unlimited information.

Disadvantages of Big Data

- Requirement of Experts:
- Traditional storage can cost lot of money to store big data.
- Lots of big data is unstructured.
- Big data analysis violates principles of privacy.
- It can be used for manipulation of customer records.

Big data analysis is not useful in short run. It needs to be analyzed for longer duration to leverage its benefits.

Big data analysis results are misleading sometimes. Speedy updates in big data can mismatch real figures.

Application of Big Data

Government

The use and adoption of big data within government process allow efficient in terms of cost, productivity and innovation, but does not come without its flaws. Data analysis often require multiple parts of government, central and local, to work in collaboration and create new and innovative processes to deliver the desired outcome since government majority acts in all the domains.



Manufacturing

Analysing big data in the manufacturing industry can reduce component defects, improve product quality, increase efficiency and save time and money.



Healthcare

Big data analytics has helped healthcare improve by providing personalized medicine, clinical risk intervention and predictive analytics, automated external and internal reporting of patient data, standardized medical terms and patient registration.



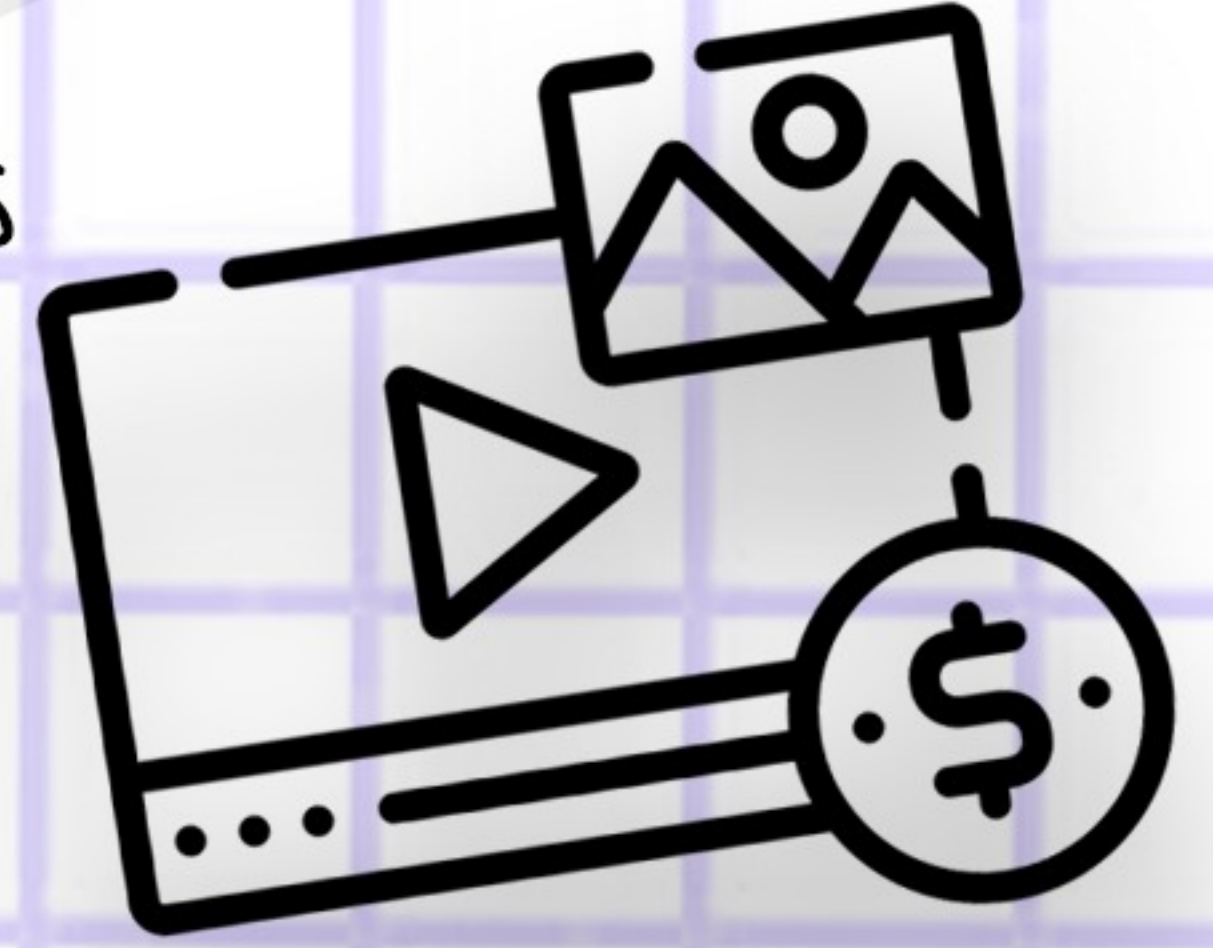
Education

In education, it is used to measure teacher's effectiveness to ensure a good experience for both students and teachers.



Media

To understand how the media utilizes big data, it is first necessary to provide some content into the mechanism used for media process.



Insurance

The big data allows better customer retention from insurance companies and also health insurance providers are collecting data on social determinants of health such as food and TV consumption, clothing size and purchasing habits, from which they make predictions on health costs for their clients.



Cloud Computing

Cloud computing means storing and accessing data and programs over the Internet instead of your computer's hard drive. Cloud terminology refers to internet or network which can be present in remote location. It provides service at both public and private networks. Several useful applications like e-mail customer relationship management and web configuring etc. run in cloud. Cloud is a general term for the delivery of hosted services over the internet.



Advantages of Cloud Computing

One can access applications as a utilities over the Internet.

Manipulate and configure the application online at any time.

It does not require installing a specific piece of software to access or manipulating cloud application. Cloud resources are available over the network in a manner that provides platform independent access to any.

Cloud computing offers on-demand selfservice. The resources can be used without interaction with cloud. Cloud Computing is highly cost effective because it operates at higher efficiencies with great utilization. It just requires an Internet connection.

Disadvantages of Cloud Computing

- Security Threat in the Cloud
- Cloud Computing companies fail to provide proper support to the customers.
- Many cloud storage service providers limit bandwidth usage of their users.
- You can't access cloud without an internet connection.
- Technical Issues

Service Models

Infrastructure as a Service

The Infrastructure as a Service (IaaS) is the most basic level of service which provides virtualized computing resources over the internet.



Platform as a Service

It provides host development tools on their infrastructures. It can be accessed by user on internet using APIs, Web portals or gateway software.



Software as a Service

It is distribution model which delivers software applications across the internet. This service is known as web services. You can access SaaS applications and services on your computer or on mobile device at any location.



Basic concepts of Cloud Computing

1. **Private Cloud** It delivered from a business's data center to internal users. It offers increased security because of its private nature.
2. **Public Cloud and Community Cloud** It is a third-party cloud service provider delivers the cloud service over the internet. The Public Cloud allows systems and services to be easily accessible to the general public. Public cloud may be less secure because of its openness, e.g. e-mail. These services are available on demand on payment basis. The Community Cloud allows systems and services to be accessible by group of organizations.

3. Hybrid Cloud

It is a combination of public and private cloud. However, the critical activities are performed using private cloud while the non-critical activities are performed using public cloud.

Application of Cloud Computing



Business



Marketing



Education



social network.



GPS/Traffic

Augmented Reality and

Virtual Reality

Virtual Reality (VR)

Virtual reality (VR) is an interactive computer-generated experience taking place within a simulated environment.



Augmented Reality

Augmented reality (AR) is an interactive experience of a real-world environment where the objects that reside in the real world are enhanced by computer-generated perceptual information.



Augmented Reality

Virtual Reality

The system augments the real-world scene

Completely immersive virtual environment

In AR User always have a sense of presence in the real world

In VR visual senses are under control of the system

AR is 25% virtual and 75% real

VR is 75% virtual and 25% real

This technology partially immerses the user into the action

This technology fully immerses the user into the action

No AR headset is needed.

Some VR headset device is needed.

With AR, end-users are still in touch with the real world while interacting with virtual objects nearer to them.

By using VR technology, VR user is isolated from the real world and immerses himself in a completely fictional world.

It is used to enhance both real and virtual worlds.

It is used to enhance fictional reality for the gaming world.

Advantages of AR

Here are the benefits of Augmented Reality:

- Offers individualized learning.
- Fostering the learning process.
- Wide variety of fields.
- Offers innovation and continuous improvement.
- Increase accuracy.
- Augmented reality can be used to increase user knowledge and information.
- People can share experiences over long distances.
- Helps developers to build games that offer "real" experience to the user.

Disadvantages of AR

Here are the cons/drawbacks of Augmented Reality:

- It is very expensive to implement and develop AR technology-based projects and to maintain it.
- Lack of privacy is a major drawback of AR.
- The low-performance level of AR devices is a major drawback that can arise during the testing phase.

- Augmented reality can cause mental health issues.
- Lack of security may affect the overall augmented reality principle.
- Extreme engagement with AR technology can lead to major healthcare issues such as eye problems and obesity etc.

Advantage of VR

Here are the pros/benefits of Virtual Reality:

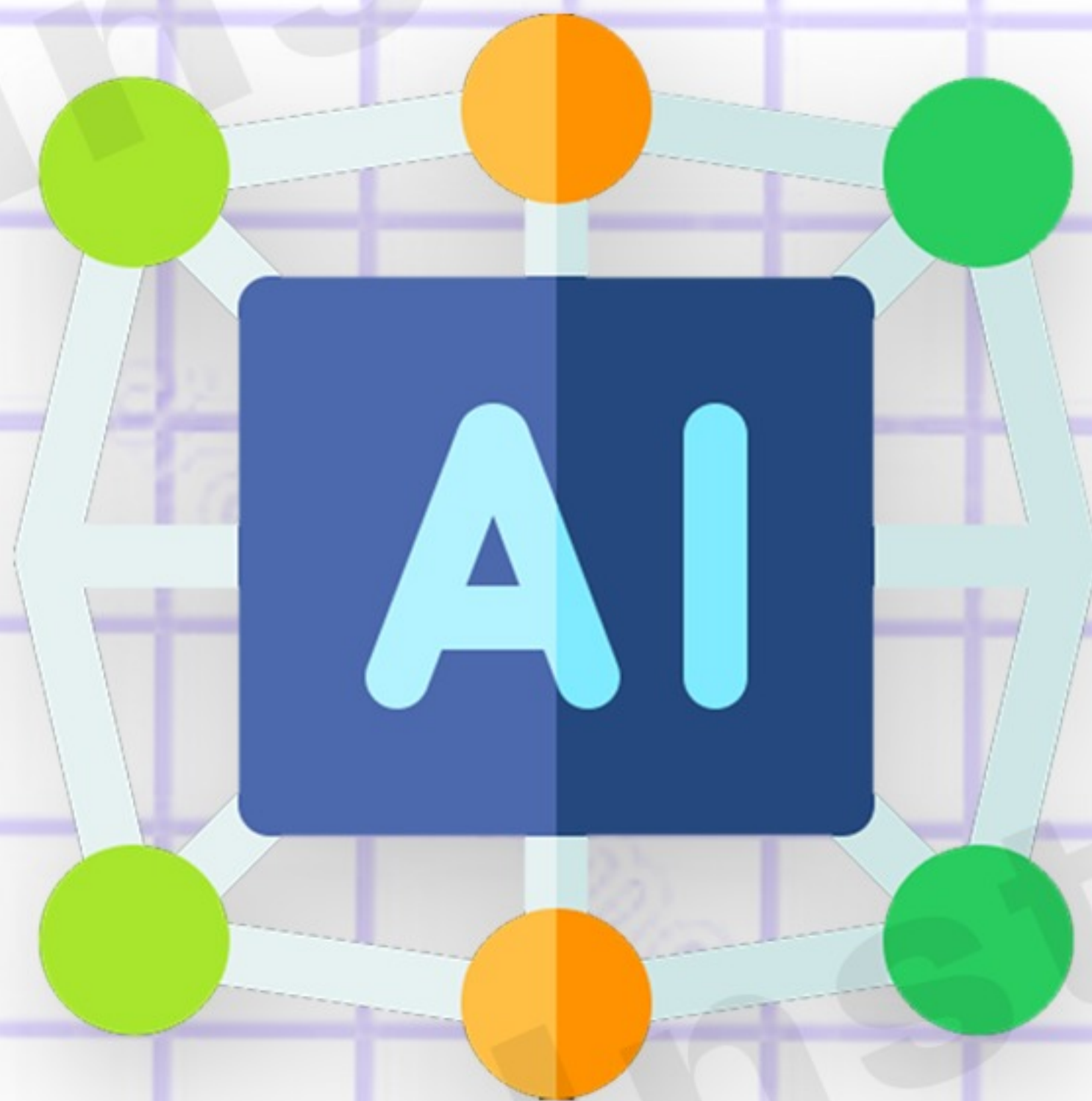
- Immersive learning
- Create an interactive environment
- Increase work capabilities
- Offer convenience
- One of the most important advantages of VR is that it helps you to create a realistic world so that the user can explore the world.
- Virtual reality in the education field makes education more easy and comfortable.
- Virtual reality allows users to experiment with an artificial environment.

Disadvantage of VR

Here are the cons/drawbacks of Virtual Reality:

- VR is becoming much more common, but programmers will never be able to interact with virtual environments.
- The escapism is common place among those that use VR environments, and people start living in the virtual world instead of dealing with real-world issues.
- Training with a VR environment never has the same result as training and working in the real world. This means if somebody done well with simulated tasks in a VR environment, there is still no guarantee that a person doing well in the real world.

Artificial Intelligence



It is a branch of Computer Science named Artificial Intelligence pursues creating the computers or machines as intelligent as human beings. **father of Artificial Intelligence John McCarthy**, Such systems may have the capability of visual perception, speech recognition, natural language processing and they may also be able to make decisions and perform tasks without human intervention to drive efficiency, improve quality and better manage supply chains.

Application of AI

Handwriting Recognition

The handwriting recognition software reads the text written on paper by a pen or on screen by a stylus. It can recognize the shapes of the letters and convert it into editable text.

Speech Recognition

It is the intelligent system which is capable of hearing and knowing the human language in terms of sentences and their meanings while a person talks to it.

Gaming

AI plays crucial role in strategic games such as chess, poker, tic-tac-toe, etc., where machine can think of large number of possible positions

Manufacturing Sector

By using AI in the manufacturing sector the Inspections, supervision, modifications, and communication can be automated

Advantages of AI

Intelligence save human energy so that human can find out new innovative ideas.

It can understand program better than humans.

There is no need to always monitor on it.

saves times,

Chances of mistakes are less.

Disadvantages of AI

Software are expensive,

Implementation cost is very high,

Maintenance cost is high

If Implementation is wrong then it might be harmful.

It can replace the job of humans.



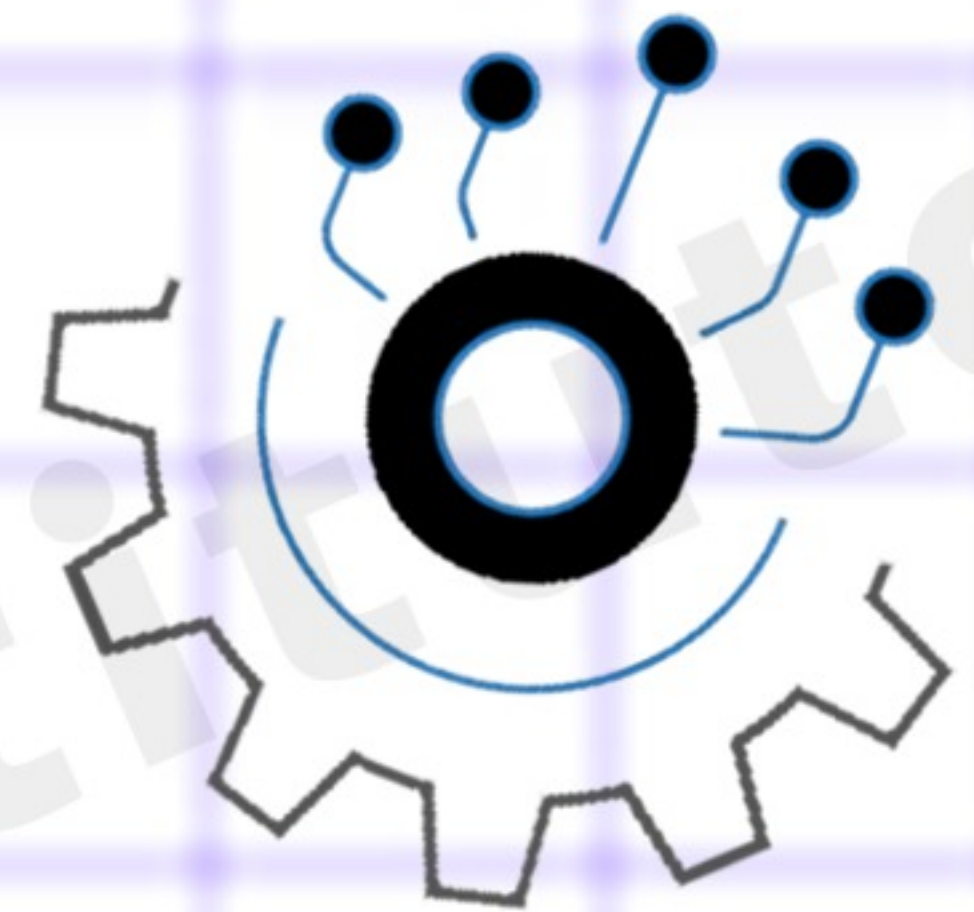
Types of Artificial Intelligence

Reactive Machine AI (react on present data)

Limited Memory AI (react on past data)

Theory of Mind AI (Take decision based on psychology)

Self-Awareness AI (Which knows about potential and weakness)



Reactive Machine AI

This type of ai includes machine that operate solely based on the present data, taking into account only the current situation. Example chess game based on artificial intelligence.

Limited Memory AI

Like the name suggests, limited memory AI can make informed and improved decision by studying the past data from its memory example self driving cars. It works on past data, experiences on data stored in past.



Theory Of Mind AI

The theory of mind AI is a more advanced type of Artificial Intelligence. This category of machines is speculated to play a major role in psychology. This type of AI will focus mainly on emotional intelligence

Self-Awareness AI

This know about the potential and weakness.

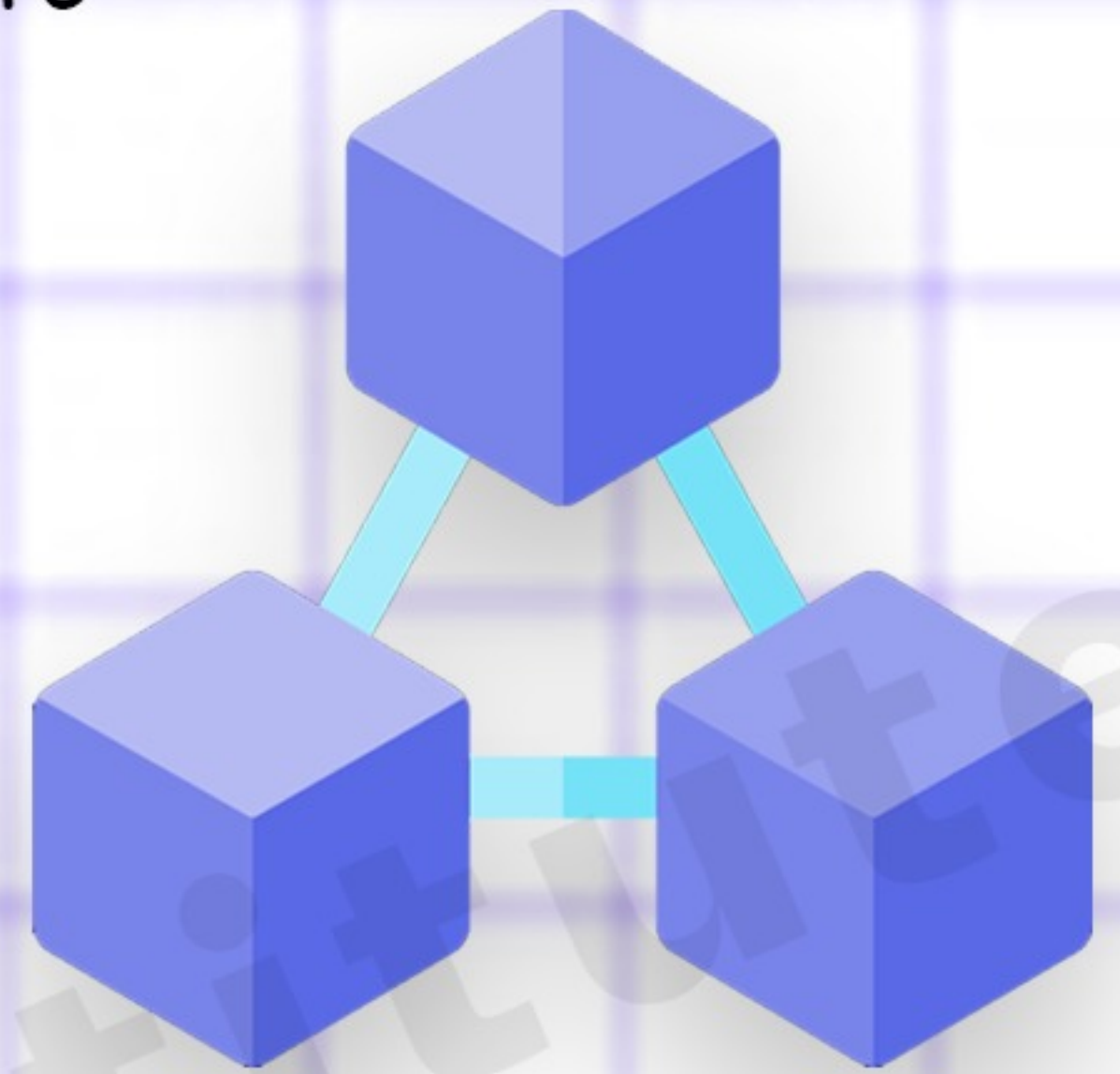
Blockchain Technology

A blockchain is a growing list of records, called blocks, which are linked using cryptography.

Each block contains a cryptographic hash of the previous block

Blockchain is a system of recording information in a way that makes it difficult or

impossible to change, hack, or cheat the system



The Three Pillars of Blockchain Technology

Decentralization

This is the main highlight of crypto and blockchain technology which refers to any kind of technology that has no governing authority by any organizations.

Immutability

Each block is linked to the previous block with transactions added in upend only mode. Any modification in the content of a block invalidates the linkage and hence the entire Blockchain.

Transparency

One of the most interesting and misunderstood concepts in blockchain is "transparency."

Advantages of blockchain technology

- Security
- fraud control,
- Access level.
- Speed.
- Increased efficiency
- Transparency
- No hidden fees

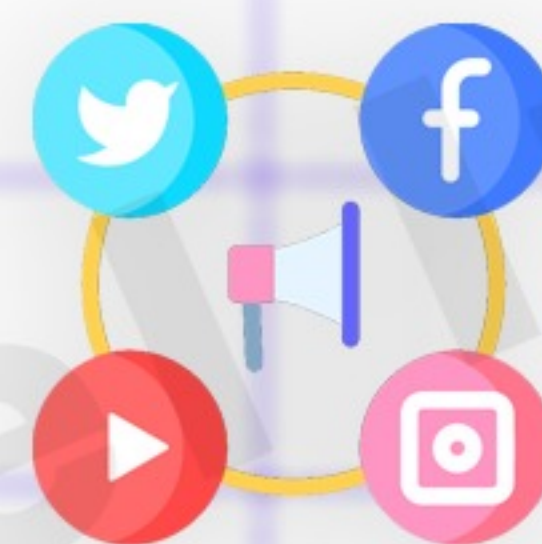


Disadvantage of Blockchain Technology

- 1) Blockchains use excessive energy.
- 2) Blockchain is not a huge distributed computing system.
- 3) mining does not provide network security.
- 4) blockchain entries do not last forever or are not immutable.
- 5) scalability remains blockchain's weakness.
- 6) blockchain is not indestructible.

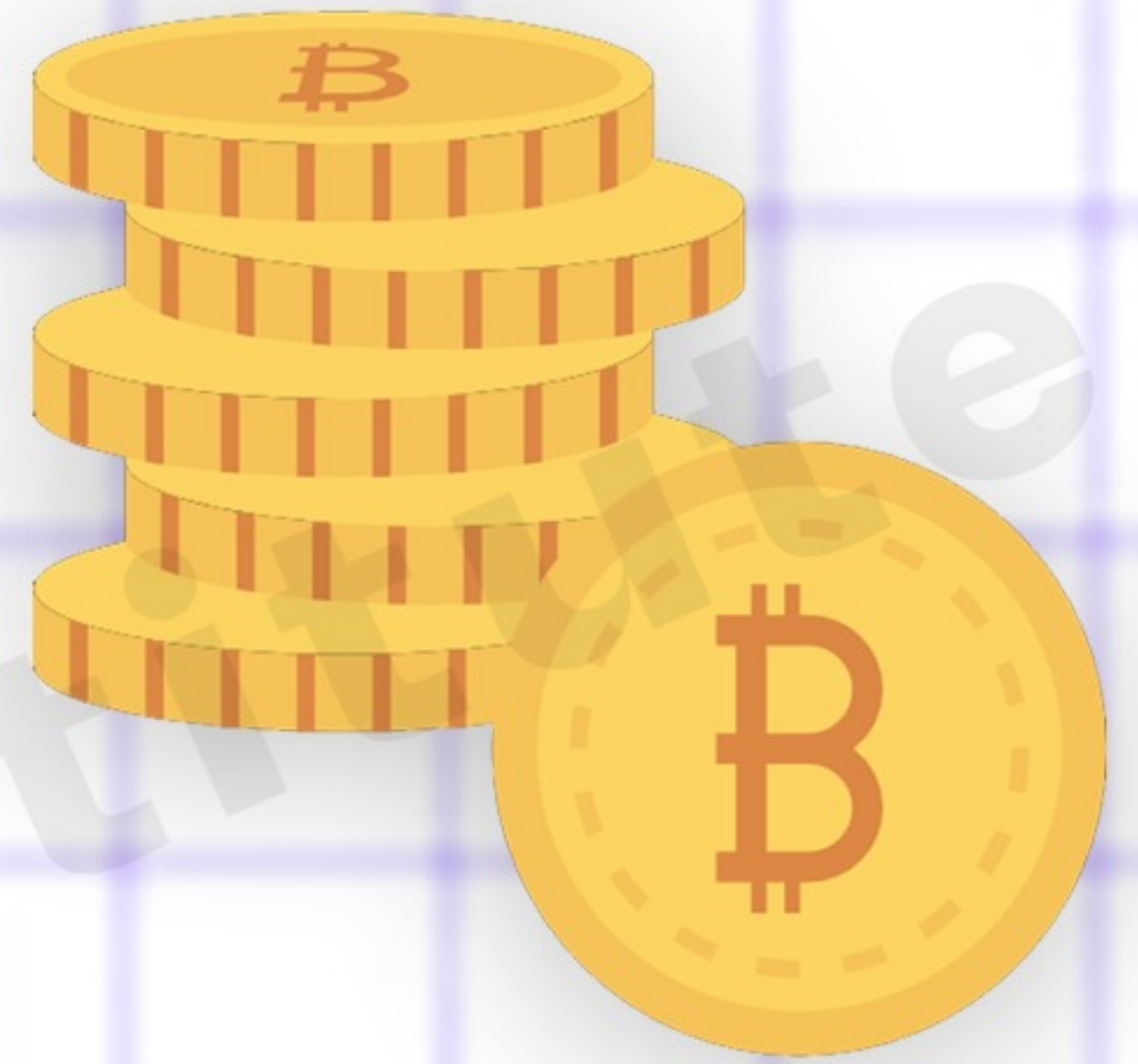
Application of Blockchain Technology

- Money transfer
- Smart contracts
- Internet of Things (IoT)
- Personal identity security
- Healthcare
- Government
- Media



What is Bitcoin?

Bitcoin is a new currency that was created in 2009 by an unknown person using the alias Satoshi Nakamoto. Transactions are made with no middle men - meaning, no banks! But much of the hype is about getting rich by trading it. The price of bitcoin skyrocketed into the thousands in 2017



3D Printing/Additive Manufacturing

3D Additive Manufacturing refers to a process by which digital 3D design data is used to build up a component in layers by depositing material. The term "3D printing" is increasingly used as a synonym for Additive Manufacturing.

How does 3d printing a work?

Step 1

It all starts with making a virtual design of the object you want to create. This virtual design is made in a CAD (Computer Aided Design).

Step 2

The STL file needs to be processed by a piece of software called a "slicer;" which converts the model into a series of thin layers and produces a G-code file.

Step 3

This G-code file can then be printed with 3D printing software.

Applications of 3D printing.

- Toys,
- statues,
- dummy for medical students.

Robotics Process Automation (RPA)

Robotic Robotic entities are called robots that imitate human actions.

Process A process represents a series of steps leading to significant work. For instance, the tea method or your favourite dish, etc.

Automation Automation is any method performed without human intervention by a robot.

Robotic process automation (RPA) is a software technology that makes it easy to build, deploy, and manage software robots that emulate humans actions interacting with digital systems and software.

Advantages

Increase Efficiency

Reduce Cost

Save Time

Accuracy

Diligence

Speed

Chances Of Mistake Are Less

Can Be Used In Vast Area

No need for training in RPA

Disadvantages

1. The automated task increases unemployment.
2. The complexity of implementation in RPA has decreased day-by-day. According to a recent study, 30% to 50% of the RPA project fails initially.
3. There is no innovative thinking in Robotic Process Automation.
4. The RPA project or system needs regular reconfiguration.
5. It is a costly technology as compare to any other technology.
6. There is a lack of technical ability in the RPA projects.

What are the Applications of the RPA?

A different application is given below:

1. Accounting

For general accounting, operational accounting, transaction reporting, and budgeting organizations can use RPA.



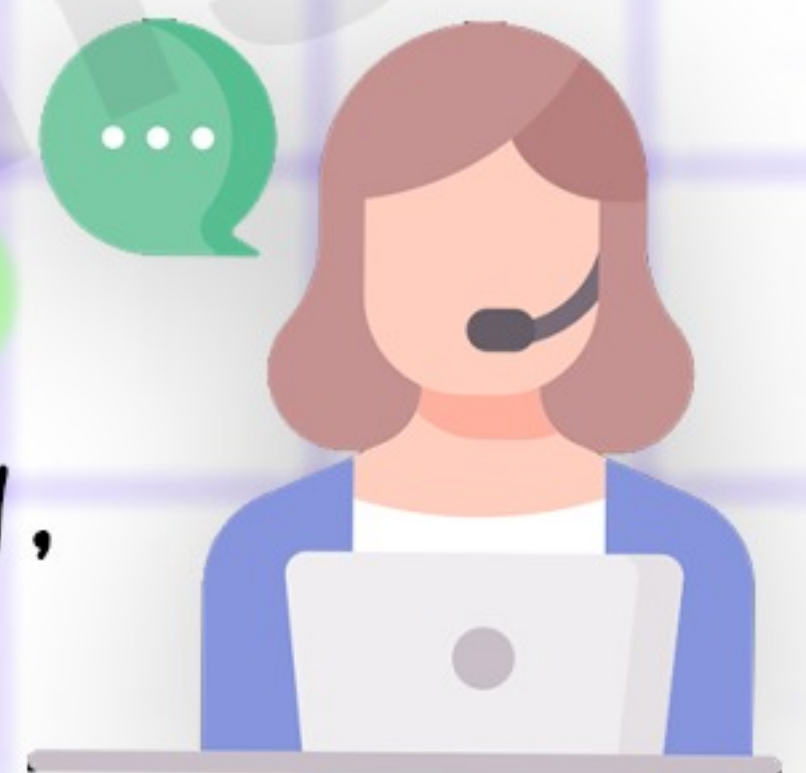
2. Healthcare

It can be used by medical organizations in the handling of patient records, claims, customer service, account management, reporting, and data analytics.



3. Customer Services

By automating contact center duties, can assist businesses to deliver improved customer service, including e-signature verification, scanned records uploading, and automated rejection approval verification data.



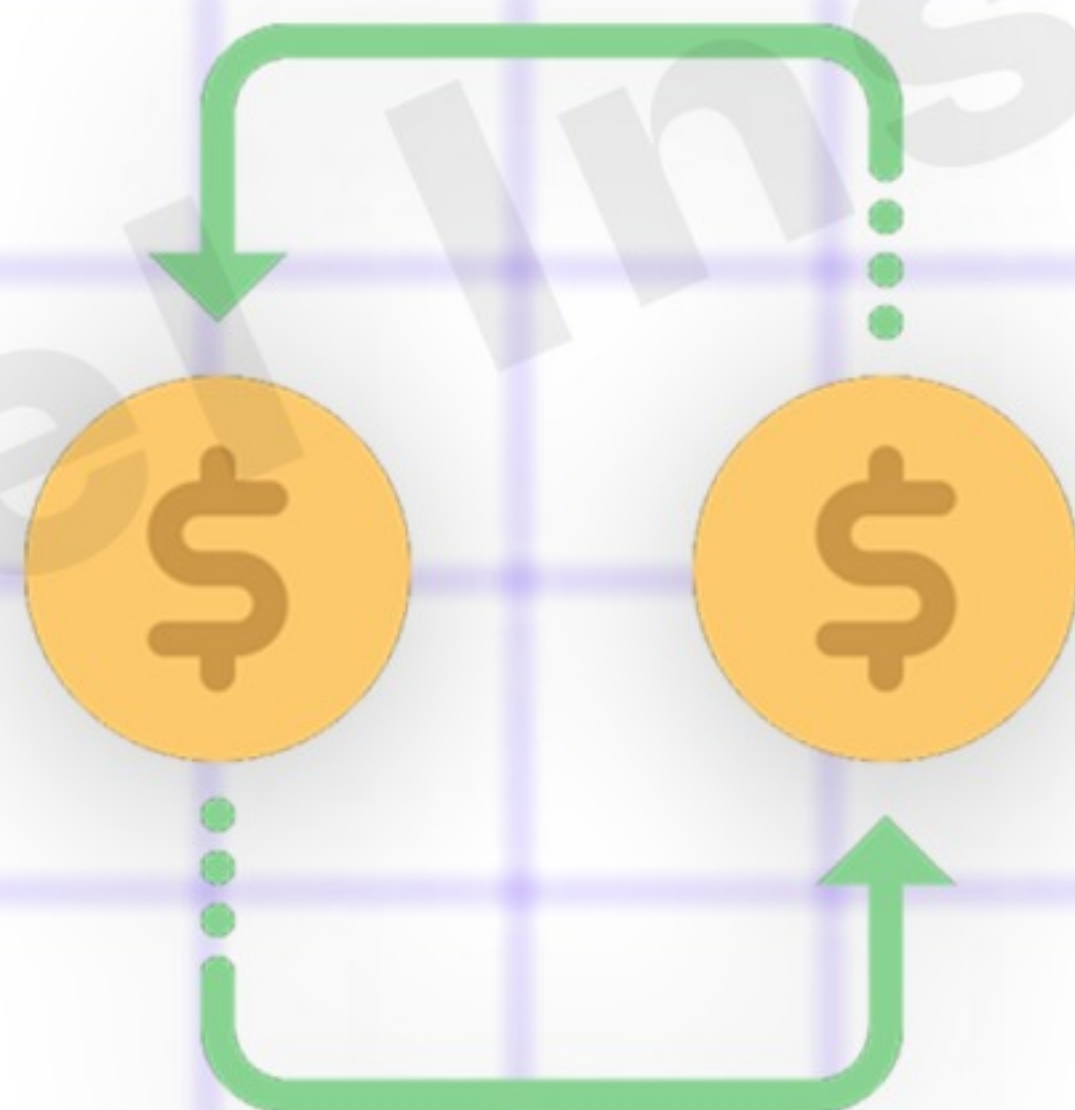
4. Human Resources

It can automate HR functions, including onboarding and offboarding, staff updates, and submission procedures of schedules.



5. Financial Services

Financial services companies may use RPA for foreign exchange payments, automation of account opening and closing, audit request management, and insurance claims processing



Cyber Security

Cybercrime

It is **criminal activity** that either targets or uses a computer, a computer network or a networked device. Most cybercrime is committed by cybercriminals or hackers who want to **make money**. However, occasionally cybercrime aims to damage computers or networks for reasons other than profit.



Types of Cyber Crimes

1. **Hacking** This is a type of crime wherein a person's computer is broken into so that his personal or sensitive information can be accessed.
2. **Theft** This crime occurs when a person violates copyrights and downloads music, movies, games and software.
3. **Cyber Stalking** cybercrime that uses the internet and technology to harass or stalk a person. It can be considered an extension of cyberbullying and in-person stalking.



4. Identity Theft

In this cyber crime, a criminal accesses data about a person's bank account, credit cards, Social Security, debit card and other sensitive information to siphon money or to buy things online in the victim's name.

5. Malicious Software

These are Internetbased software or programs that are used to disrupt a network.

6. Denial of Service Attack

This is an act by the criminal, who floods the band width of the victim's network or fills his e-mail box with spam mail depriving him of the services he is entitled to access or provide .



7. Credit Card Fraud

credit card numbers can be stolen by the hackers who can misuse this card by impersonating the credit card owner.

8. Phishing

It is technique of pulling out confidential information from the bank/financial institutional account holders by deceptive means.

9. Salami Attack

In such crime criminal makes insignificant changes in such a manner that such changes would go unnoticed.

10. Email Bombing

This kind of activity refers to sending large number of mail to the victim, which may be an individual or a company or even mail servers there by ultimately resulting into crashing.

11. Trojan Attack

The victim receives an official-looking email with an attachment. The attachment contains malicious code that is executed as soon as the victim clicks on the attachment.



12. Virus / Worm Attacks

Viruses are programs that attach themselves to a computer or a file and then circulate themselves to other files and to other computers on a network.

13. Data Diddling

This kind of an attack involves altering raw data just before a computer processes it and then changing it back after the processing is completed.

14. Logic Bombs

These are event dependent programs. This implies that these programs are created to do something only when a certain event occurs.



15. Internet time thefts

Normally in these kinds of thefts the internet surfing hours of the victim are used up by another person.

16. Web jacking

This term is derived from the term hijacking. In these kinds of offences the hacker gains access and control over the website of another.

Cyber security

it is the practice of defending computers, servers, mobile devices, electronic systems networks, and data from malicious attacks.

Cyber security objectives

1. Maintaining Data Confidentiality
2. Data Integrity Preservation
3. Limiting data accessibility to just authorized users

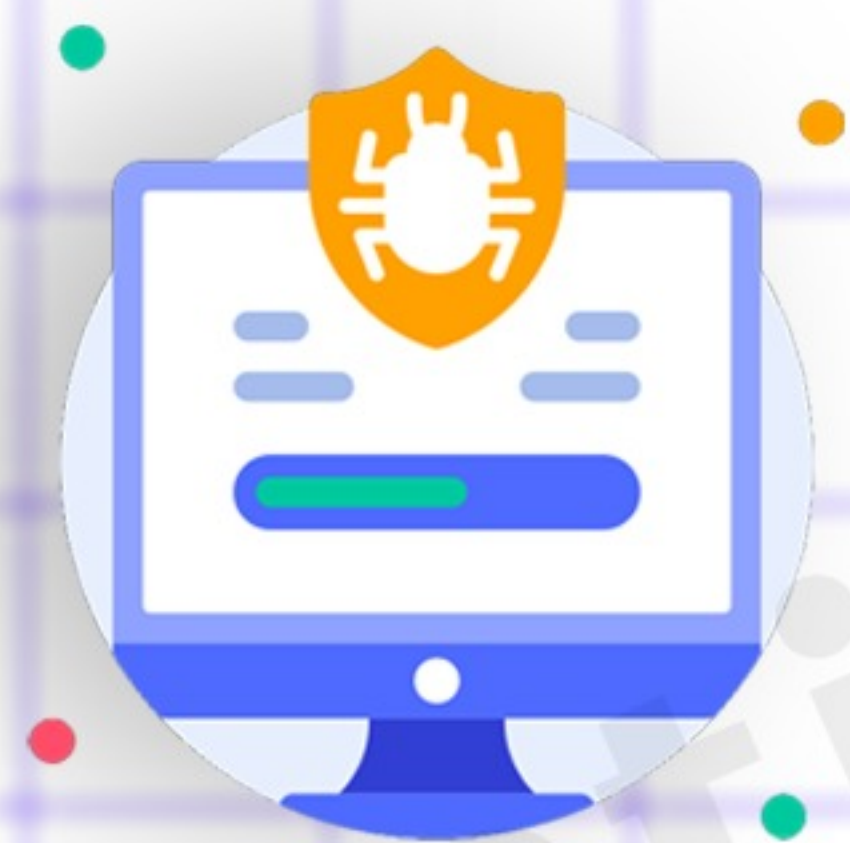
Need of Cyber Security

1. Protects Personal Data.
2. Protects Business Reputation.
3. Enhances Productivity.
4. Better Data Management.
5. Understanding the risk environment.
6. Protect from attacks on confidentiality.
7. Protect from attack on integrity.
8. Protect from attack on availability.



Prevention of Cyber Crime

1. Protect your e-identity.
2. Protect your Data.
3. Avoid being scammed.
4. Secure your Mobile Devices.
5. Call the right person for help.
6. Install the latest operating system updates.
7. Passwords.
8. Firewalls are the first line of cyber defense.
9. Secure your wireless network.
10. Be Social Media Savvy.



Malwares and Malware Types

- 1. Adware** Adware displays ads on your computer.
- 2. Spyware** Spyware is software that spies on you, tracking your internet activities
- 3. Virus** A virus is a contagious program or code that attaches itself to another piece of software and then reproduces itself when that software is run.
- 4. Worm** A program that replicates itself and destroys data and files on the computer.
- 5. Backdoors** The simplest backdoor attack definition is using any malware/virus/technology to gain unauthorized access to the application/system/network while bypassing all the implemented security measures.
- 6. Keyloggers** Records everything you type on your PC in order to glean your log-in names, passwords and other sensitive information, and send it on to the source of the keylogging program.

7. Rogue security software

This one deceives or misleads users. It pretends to be a good program to remove Malware infections, but all the while it is the Malware. Often it will turn off the real Anti-Virus software.

Securing PC

Follow these steps to secure your PC from Cyber Crime:

1. Only use trusted sites when providing your personal information:
2. Don't open email attachments or click links in emails from unknown sources:
3. Always keep your devices updated:
4. Back up your files regularly
5. Enable your Firewall:
6. Adjust your browser settings:
7. Install Antivirus & spyware software:
8. Password protects your software and locks your device:
9. Encrypt your data:
10. Use a VPN: Virtual Private Network (VPN)

