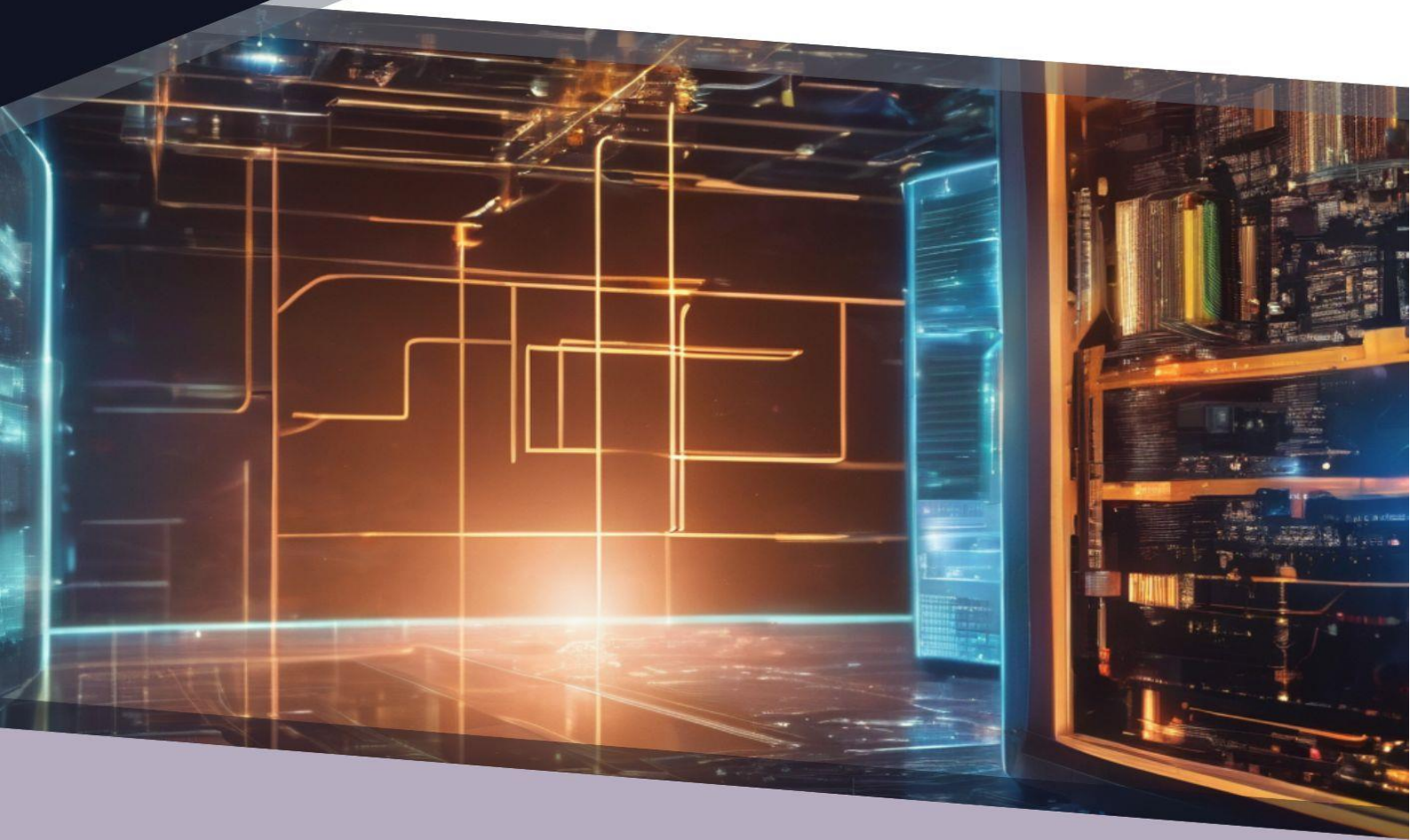


COMPUTER INFO - GALLERY

2023 - 2024

VOLUME - 12



**IT ANTHOLOGY
CREATED BY STUDENTS'**

PREFACE

Welcome to the latest volume in our ongoing series dedicated to introducing newcomers to the dynamic world of Computer Science. With each edition, we strive to provide comprehensive guidance to students entering the Department of Computer Science (UG).

This volume marks the culmination of years of dedication and effort, as we celebrate the publication of our 12th instalment, spanning from 2012 - 2024. Our journey began with a simple yet powerful idea to create a resource that not only aids students in understanding the fundamentals of computing but also fosters originality and critical thinking in their assignments.

The genesis of this book emerged from the desire to streamline the assignment process and promote academic integrity. By offering a diverse range of non-repetitive topics, we aim to inspire students to explore new avenues of thought and creativity. What started as a spark of innovation has blossomed into a comprehensive guide that benefits students across various levels of expertise.

In this volume, we have curated content tailored to equip students with a strong foundation in computer science, with a particular focus on emerging areas such as Autonomous systems. We're delighted to announce that copy of this book will be readily available in our Department Library, ensuring accessibility to all students. Additionally, the e-content will be accessible through our college website.

I extend my heartfelt gratitude to the esteemed Correspondent Sir, the respected Principal Sir, and our beloved Head of the Department (CS), Prof. P. Ramesh, for their unwavering support and encouragement. Special thanks are also due to our dedicated faculty members for their invaluable contributions and to our students for their continued cooperation.

As we embark on this journey together, rest assured that the Department of Computer Science (UG) remains committed to fostering an environment of learning and growth. We pledge to continuously seek ways to enhance the educational experience and empower our students for success in their academic pursuits and beyond.

Thanking You,

INFO-GALLERY IN-CHARGE

Dr. M. SHANMUGAPRIYA



BEST WISHES

**To embrace the power of
innovation to unlock the full potential
of our students and the Institution...**

HOD

Principal

Correspondent

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1. COMPUTER PERIPHERAL

Computer peripheral definition:

A peripheral device is an internal or external device that connects directly to a computer or other digital device but does not contribute to the computer's primary function, such as computing. It helps end users access and use the functionalities of a compute



Computer peripheral types:

- Input-Input device send data to the computer.
- Output- Output device receive data from the computer.
- Input/Output-Input/Output device are also known as storage device.

Computer peripheral examples:

- Mouse
- Keyboard
- Webcam
- Microphone
- Monitor
- Speakers
- Projector
- Printer
- USB Flash Drive
- External Hard Drive.

Advantages of computer peripheral:

Peripheral devices provide more features due to this operation of the system is easy. These are given below:

- It is helpful for taking input very easily.
- It is also provided a specific output.
- It has a storage device for storing information or data.
- It also improves the efficiency of the system.

How does peripheral works:

- Peripheral devices typically communicate with the CPU in one of two ways: directly via dedicated cables or via bus technology
- Directly connected peripherals are typically limited in their speed but offer dedicated data transfer from device to CPU with no interference from other components on the bus system.
- Bus systems allow for multi-device connectivity but often require shared bandwidth due to multiple requests made at once by different components on the same bus system.

Why are peripheral important:

- Peripherals play an important role in allowing users to interact with computers using their own preferences while also allowing them access to additional data source relevant to their tasks at hand.
- Keyboards allow users to type in words quickly without having to point and click each one individually.
- Printers enable users to get hard copies of documents they've created. Scanners help capture text or photos into editable formats.
- External hard drives provide backup/storage space while freeing up space on the local drive; networking equipment opens up communication with other machines over a network; and digital cameras let people take pictures easily rather than having them manually drawn out by hand.

2. DISTRIBUTED OPERATING SYSTEMS

Distributed operating system (DOS) is an essential type of operating system. Distributed systems use many central processors to serve multiple real-time applications and users. As a result, data processing jobs are distributed between the processors.

It connects multiple computers via a single communication channel. Furthermore, each of these systems has its own processor and memory. Additionally, these CPUs communicate via high-speed buses or telephone lines. Individual systems that communicate via a single channel are regarded as a single entity. They're also known as loosely coupled systems.



This operating system consists of numerous computers, nodes, and sites joined together via LAN/WAN lines. It enables the distribution of full systems on a couple of center processors, and it supports many real-time products and different users. Distributed operating systems can share their computing resources and I/O files while providing users with virtual machine abstraction.

Types of Distributed Operating System:

There are various types of Distributed Operating systems. Some of them are as follows:

- Client-Server Systems
- Peer-to-Peer Systems
- Middleware
- Three-tier
- N-tier

Client-Server Systems:

This type of system requires the client to request a resource, after which the server gives the requested resource. When a client connects to a server, the server may serve multiple clients at the same time. Client-Server Systems are also referred to as "Tightly Coupled Operating Systems". This system is primarily intended for multiprocessors and homogenous multicomputer. Client-Server Systems function as a centralized server since they approve all requests issued by client systems.

Server systems can be divided into two parts:

- **Computer Server System**

This system allows the interface, and the client then sends its own requests to be executed as an action. After completing the activity, it sends a back response and transfers the result to the client.

- **File Server System**

It provides a file system interface for clients, allowing them to execute actions like file creation, updating, deletion, and more.

Peer-to-Peer Systems:

The nodes play an important role in this system. The task is evenly distributed among the nodes. Additionally, these nodes can share data and resources as needed. Once again, they require a network to connect. The Peer-to-Peer System is known as a "Loosely Couple System". This concept is used in computer network applications since they contain a large number of processors that do not share memory or clocks.

Middleware:

Middleware enables the interoperability of all applications running on different operating systems. Those programs are capable of transferring all data to one other by using these services.

Three-tier:

The information about the client is saved in the intermediate tier rather than in the client, which simplifies development. This type of architecture is most commonly used in online applications.

N-tier:

When a server or application has to transmit requests to other enterprise services on the network, n-tier systems are used.

3. ATM USING FINGERPRINT

Introduction:

Fingerprint Based ATM is a desktop application where fingerprint of the user is used as an authentication. The finger print minutiae features are different for each human being so the user can be identified uniquely.



Fingerprint:

What Is a Fingerprint? A fingerprint is the feature pattern of one finger. It is believed with strong evidence that each fingerprint is unique. Each person has his own fingerprints with permanent uniqueness. So, fingerprints have been used for identification and forensic investigation for a long time. A fingerprint is composed of many ridges and furrow.

Fingerprint authentication:

The fingerprint authentication problem can be grouped into two sub-domains. One is fingerprint verification and the other is fingerprint identification. In addition, different from the manual approach for fingerprint authentication by experts, the fingerprint authentication here is referred to as FAA (Fingerprint Authentication in ATM), which is program based. Fingerprint verification is to verify the authenticity of one person by his fingerprint. The user provides his fingerprint together with his identity information like his PIN-CODE. The fingerprint verification system retrieves the fingerprint template according to the PIN-CODE and matches the template with the real time acquired fingerprint Impact Factor: it is the underlying design principle of AFAS (Automatic Fingerprint Authentication System). Fingerprint identification is to specify one person's identity by his fingerprint(s).

Fingerprint based ATM machine:



Biometric can be used to identify physical and behavioural characteristics of user fingerprints. There are many biometric devices like iris detection, face recognition, and fingerprint. Users' fingerprints are scanned using biometric traits and stored in a database. All fingerprints have unique characteristics and patterns. A normal fingerprint pattern is made up of lines and spaces. These lines are called ridges while the spaces between the ridges are called valleys. Fingerprint biometric are easy to use, cheap and most suitable for everyone. Characteristics of fingerprints vary from person to person. Fingerprints are the unique identity of the user. Data of a fingerprint is stored in a database using the enrolment process through the Bank. Banks provide authentication to the customer that can be accessed while performing the transaction process.

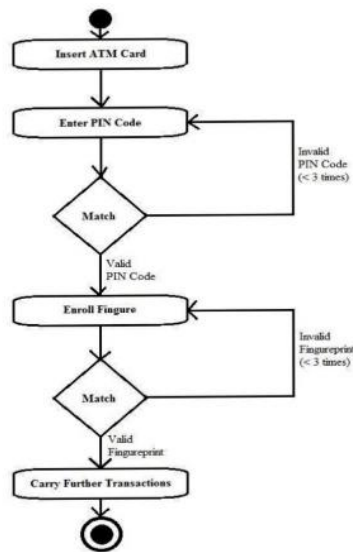
Binarization:

Fingerprint binarization is to transform the 8-bit gray fingerprint image to a 1-bit image with 0-value for ridges and 1-value for furrows. After the operation, ridges in the fingerprint are highlighted with black colour while furrows are white. A locally adaptive binarization method is performed to binarize the fingerprint image. Such a named method comes from the mechanism of transforming a pixel value to 1 if the value is larger than the mean intensity value of the current block (16x16) to which the pixel



Image: The fingerprint image after adaptive binarization binarized image (left), enhanced grey image (right).

Flow chart:



Advantages and disadvantages:

- Fingerprint Based ATM System is more secure than ATM card.
- User can make transaction using his fingerprint anywhere and at only time he need not have to carry ATM card.
- If the user fingerprint has some cut or got damaged the system might not recognize the user.

Conclusion:

The execution of ATM protection by availing fingerprint also has the traditional verifying methods that were inputting the client's fingerprints, that is sent by the administrator and checked correctly. The protection feature was improved highly for the firmness and solidity of the client's identity. The complete system was constructed on a fingerprint system that makes the mechanism safe, dependable and effortless to avail. This shall be the most favourable technology in electronic or digital money transactions.

4. SMART E-MAIL SECURITY

Email Security Definition:

Email security involves the strategic set of measures and techniques used to protect email-based communications, effectively preserving the confidentiality, integrity, and availability of email messages. As a critical safeguard for all types of organizations and professionals, email security prevents unauthorized access resulting in data breaches, detects and blocks malicious content, and ensures the privacy of sensitive information being transmitted.

As the most commonly leveraged communication channel among cyber attackers and criminals, email is often exploited to spread malware and viruses, steal sensitive data, deploy ransomware and phishing attacks, and manipulate users into divulging confidential information. Email security solutions are designed to protect against the ever-evolving spectrum of email-borne attack vectors.

Email Security Benefits:

Email security can help detect and resolve email threats such as phishing or spoofing, which can lead to devastating breaches and the risk of malware or other harmful computer viruses. Email encryption can prevent accidents and aid in the prevention of costly data breaches. It protects confidential information such as credit card numbers, bank accounts, employee PII, and intellectual property.

Secure email encryption solutions can bolster confidentiality by ensuring that only the intended recipients can access the email content. Email security can help detect malicious or spam emails that might breach the mail system's spam filter, making accounts vulnerable to engaging with such emails.

Email security can protect sensitive information, such as intellectual property, financial records, and top-secret company information and trade secrets, from interception by malicious actors like hackers and cybercriminals.

Types of Email Attack:

Attackers impersonate a legitimate organization to trick users into revealing sensitive information. Manipulating people into divulging confidential information or performing actions that compromise security. A targeted version of phishing that focuses on specific individuals or organizations using personalized emails. Malicious software that encrypts files or systems until a ransom is paid.

Software designed to infiltrate and damage computer systems without the user's consent. Attackers forge email headers to make them appear as if the message is from a trusted source. An attacker intercepts communication between two parties and can read, modify, or inject messages. A sophisticated type of email attack where an attacker steals sensitive data from an organization's email system.

How Secure is Email?:

Email was originally designed to be as open and accessible as possible. It allows people in organizations to communicate with each other and with people in other organizations. The problem is that the security of email, on its own, is not reliable. Given its open format and the heightened sophistication of attacks, email is inherently not secure, requiring organizations to implement email security solutions, policies, and best practices to protect against email-derived attacks.

Over the years, organizations have been increasing their level of email security, making it harder for attackers to access sensitive or confidential information. Yet, social engineering tactics and other human-centric attacks have upped the ante for more stringent and secure email systems.

Email Security Policies:

Email account passwords should be complex, difficult to guess, and changed regularly. Employees should not use the same password for multiple accounts. Create policies regarding acceptable file types for attachments and implement scanning tools to detect malware before it enters the network.

5. IMAGE IDENTIFICATION SYSTEM

Introduction:

An Image Identification System is a computer-based technology that uses artificial intelligence (AI) to recognize and categorize objects or patterns within digital images. This system has a wide range of applications, from security and surveillance to medical diagnostics and even social media tagging. This essay will provide a basic overview of how image identification systems work and their practical uses.



How Image Identification Systems Work:

Data Collection:

The process begins with the collection of image data. This data can be in the form of photographs, videos, or any digital imagery.

Preprocessing:

Before the image can be analysed, it goes through preprocessing. This step includes resizing, noise reduction, and other enhancements to improve the image's quality and consistency.

Feature Extraction:

Features are specific characteristics or patterns within an image. These can include colours, shapes, textures, and more. Feature extraction algorithms analyse the image to identify these key elements.

Machine Learning:

Image identification systems typically use machine learning algorithms to train the system. This involves providing the system with a large dataset of images, each labelled with the object or pattern it contains. The algorithm learns to recognize patterns by adjusting its internal parameters.

Classification:

Once the system is trained, it can classify new, unseen images. It does this by comparing the features extracted from the input image to those it has learned during training. The system then assigns a label or category to the image.

Practical Applications:

Security and Surveillance:

Image identification systems are used in security cameras to identify and track intruders or suspicious activities. They can also be used for facial recognition to grant access to secure areas.

Medical Diagnosis:

In the medical field, these systems help identify and analyse medical images, such as X-rays or MRIs. They can assist doctors in diagnosing diseases and conditions.

Automated Driving:

Self-driving cars use image identification systems to detect and recognize objects like pedestrians, road signs, and other vehicles to make driving decisions.

E-commerce:

Online retailers use image recognition to enable users to search for products using images. For example, a user can take a photo of an item they want, and the system will find similar products in the store's inventory.

Challenges and Considerations:

While image identification systems have made significant advancements, they are not without challenges:

- The accuracy of these systems heavily relies on the quality and diversity of the training data.

- The use of image recognition in surveillance and social media has raised privacy concerns regarding the collection and use of personal data.
- Biases in the training data can lead to biased results, which can have ethical and social implications.

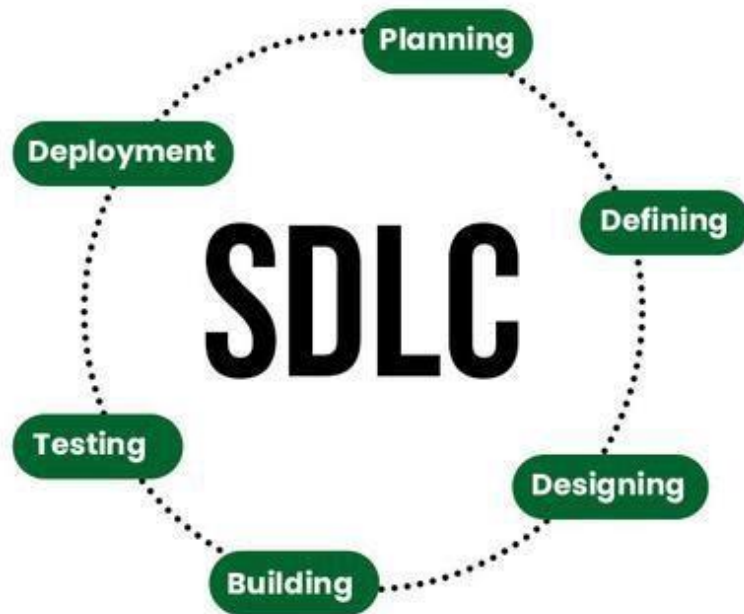
Conclusion:

In conclusion, Image Identification Systems represent a monumental leap in AI technology, transforming the way we interact with visual data. From bolstering security and revolutionizing healthcare to enabling safer autonomous vehicles and enhancing e-commerce and social media platforms, these systems have found their place in numerous industries.

However, they are not without their challenges, such as data quality, privacy concerns, and bias. Addressing these issues is paramount as we continue to harness the potential of Image Identification Systems. As technology advances, the responsible development and ethical implementation of these systems is key to realizing their full potential for the betterment of society.

6. SOFTWARE DEVELOPMENT LIFE CYCLE

Software development life cycle (SDLC) is a structured process that is used to design, develop, and test good-quality software. SDLC, or software development life cycle, is a methodology that defines the entire procedure of software development step-by-step.



The goal of the SDLC life cycle model is to deliver high-quality, maintainable software that meets the user's requirements. SDLC in software engineering models outlines the plan for each stage so that each stage of the software development model can perform its task efficiently to deliver the software at a low cost within a given time frame that meets users' requirements.

A typical Software Development Life Cycle consists of the following stages,

Stage 1: Planning and Requirement Analysis

Requirement analysis is the most important and fundamental stage in SDLC. It is performed by the senior members of the team with inputs from the customer, the sales department, market surveys and domain experts in the industry. This information is then used to plan the basic project approach and to conduct product feasibility study in the economical, operational and technical areas.

Stage 2: Defining Requirements

Once the requirement analysis is done the next step is to clearly define and document the product requirements and get them approved from the customer or the market analysts. This is done through an SRS (Software Requirement Specification) document which consists of all the product requirements to be designed and developed during the project life cycle.

Stage 3: Designing the Product Architecture

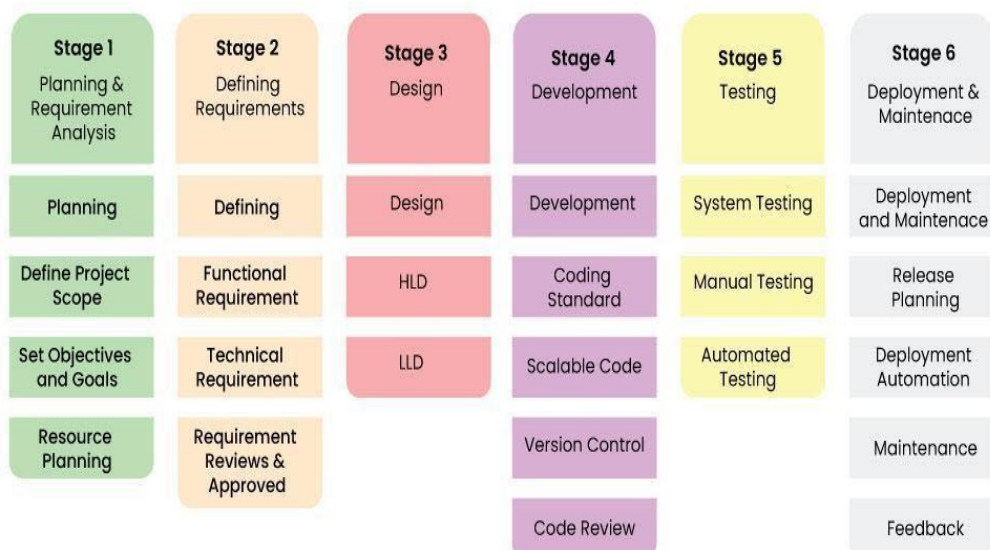
SRS is the reference for product architects to come out with the best architecture for the product to be developed. Based on the requirements specified in SRS, usually more than one design approach for the product architecture is proposed and documented in a DDS - Design Document Specification.

Stage 4: Building or Developing the Product

In this stage of SDLC the actual development starts and the product is built. The programming code is generated as per DDS during this stage. If the design is performed in a detailed and organized manner, code generation can be accomplished without much hassle.

Stage 5: Testing the Product

This stage is usually a subset of all the stages as in the modern SDLC models, the testing activities are mostly involved in all the stages of SDLC. However, this stage refers to the testing only stage of the product where product defects are reported, tracked, fixed and retested, until the product reaches the quality standards defined in the SRS.



Stage 6: Deployment in the Market and Maintenance

Once the product is tested and ready to be deployed it is released formally in the appropriate market. Sometimes product deployment happens in stages as per the business strategy of that organization. The product may first be released in a limited segment and tested in the real business environment (UAT- User acceptance testing).

Conclusion:

In conclusion, we now know that Software Development Life Cycle (SDLC) software engineering is an important framework for the better and more structured development of optimized software programs. In a world full of rapid evolution in technology, SDLC phases plays a crucial role in enabling some good and innovative solutions for helping users and organizations. Also, it's better to adapt SDLC principles to achieve software development goals effectively.

7. BLUETOOTH BASED SMART SENSOR NETWORKS

Wireless sensor networks are networks of small devices having sensors, microprocessors and wireless communication interfaces. This technology has become famous lately. For the purpose of communication in Industrial field, WSN technology is widely used. Sensors are used for the communication in industries. In this process, the signals are sent through the wires from each field devices and are monitored on central control room.

Bluetooth hardware architecture:

Bluetooth hardware has 3 prime function modules:

1. 2.4 GHz Bluetooth radio frequency Trans receiver unit.
2. Link controlling unit.
3. Host controller interface.

Host controller is made up of a digital signal processing section with link controller and central processor. Link controller composed of both hardware and software parts for the execution of base band processing and physical layer protocols CPU core helps Bluetooth module to filter page request and to handle enquiries Link manager is software which runs on the CPU and communicates to them with the help of link manager protocols.

A wireless sensor network:

Wireless sensor network provides two important actions querying and tasking. Querying. When there is need of current value of observed event, queries are used Tasking It is more composite operation and is useful when an event needs to be noticed for a long time. These two services querying and tasking are allocated to the system through "gateway" which also forwards the collected responds to users. The main functions of a gateway are,

- Interaction with sensor networks
- Short wireless transmission is used.
- It contributes functions like finding of smart sensor nodes Provides techniques of sending and receiving data from sensors, routing.
- It controls gateway attachment and dataflow to and from sensor network
- It provides standard of dealing with ideas that gives detail about the current participating sensors and their characteristics.

- It allocates function for consistent approach to sensors without being affected by their type, location or network topology, introduce queries and tasks and gather respond Communication with Users.

Gateway communication with user and another sensor networks through the internet, WAN, Satellite or other short communication technology.

Advantages:

- Inexpensive
- Low Power utilization
- Small range.
- Wireless Technology. Sensible throughput.
- Cheap maintenance cost
- Easy link formation.
- Share voice and data

Limitations:

- Low data range.
- Interference with another device.
- Low security.
- Low data rate.

Smart sensor nodes discovery:

For the execution for the gateway installation the first step is the locating of the smart sensor nodes. With the help of gateway, all the smart nodes are found and build the list of the attribute of sensors and network topologies. After that for making the process easy for the removal of existing sensor and addition of the new it is executed concurrently.

8. GRAPHICAL PASSWORD AUTHENTICATION

Introduction:

An Overview of Graphical Password Authentication. we will discuss the importance of digital identity security and the use of graphical password authentication as a secure method of authentication.

Graphical password:

Graphical passwords were originally described by BLONDER in 1996. It is an authentication system that works by having the user select from images, in a specific order, presented in a graphical user interface (GUI). For this reason, the graphical- password approach is sometimes called graphical user authentication (GUA).

Digital identity security:

Digital identity security is becoming increasingly important in today's world. With the rise of cyber-attacks, it is essential to protect our digital identities. A secure authentication method is necessary to ensure that only authorized individuals have access to our digital information.

Traditional password authentication:

Traditional password authentication methods have become vulnerable to cyber-attacks. Passwords are often easy to guess or crack, and users tend to use the same password across multiple accounts. This makes it easy for hackers to gain access to sensitive information.

Graphical password authentication:

Graphical password authentication is a secure method of authentication that uses images or patterns instead of traditional alphanumeric passwords. Users select an image or draw a pattern as their password, making it more difficult for hackers to guess or crack.

Advantages of graphical password authentication:

Graphical password authentication offers several advantages over traditional password authentication. It is more secure, as images or patterns are harder to guess or crack. It is also easier to remember, as users can select an image or pattern that has personal significance.

Disadvantages of graphical password authentication:

- Require much more storage space than text-based passwords.
- Shoulder Surfing: As the name implies, shoulder surfing is watching over people's shoulders as they process information. Because of their graphic nature, nearly all graphical password schemes are quite vulnerable to shoulder surfing.

Types of graphical password authentication:

There are several types of graphical password authentication methods, including recognition-based, recall-based, and cued- recall-based methods. Recognition-based methods require users to select an image from a set of images, while recall-based methods require users to draw a pattern from memory.

- Recall Based Techniques: User is asked to reproduce something that he created or selected earlier during the registration stage.
- Recognition Based Techniques: A user is presented with a set of images and the user passes the authentication by recognizing and identifying the images he selected during the registration stage.

Implementation of graphical password:

Graphical Password can be implemented in authenticating several systems and websites. The implementation has few focuses:

- Password: Contain image as reference & encryption algorithm.
- Login: Contains username, images, Graphical password and related methods.
- SSR shield: Contains shield for Shoulder surfing.
- Grids: Contains unique grid values and grid clicking related methods.

Conclusion:

Graphical passwords are an alternative to textual alphanumeric password. It satisfies both conflicting requirements i.e. it is easy to remember & it is hard to guess. By the solution of the shoulder surfing problem, it becomes more secure & easier password scheme. By implementing other special geometric configurations like triangle & movable frame, one can achieve more security.

9. WIRELESS INTERNET SECURITY

Introduction:

Wireless network is a network set up by using radio signal frequency to communicate among computers and other network devices, sometimes it is referred as Wi-Fi network or WLAN and it is getting popular nowadays due to easy setup feature and no cabling involved [1]. Wireless Internet access technology is being gradually arrayed in both office and public surroundings, as well as by the Internet users at home.

Background and literature survey:

Network security challenges, attacks and threats:

According to the threats in the network were not known to public people till prices of wireless equipment went down around 2000, before that date, the military was the number one client for wireless security products especially during the cold war but now days every person, company and even military are very much aware of network security.

As per Denial of Service (DoS) attack is the most severe security threat among various security risks, because DoS can compromise the availability and integrity of broadband wireless network. discussed about computing as the most new technology adopted in the wireless network today in the case of shift of information technology but security and privacy are perceived as primary obstacles to its wide adoption in modern technological information.

In their paper titled „A Secure and Lightweight Approach for Routing Optimization in Mobile IPv6, [9], found out security weakness in mobility support that has a direct consequence on the security of users because it obscures the distinction between devices and users and they went further by finding that, a malicious and unauthenticated message in mobility support may open a security hole for intruders by supplying an easy mean to launch an attack that hijacks an ongoing session to a location chosen by the intruder, so they come up with the solution on how to thwart such a session hijacking attack by authenticating a suspicious message.

Osi model in network security:

To adequately secure the integrity of a network, administrators require standards of the framework to implement various protocols. In order to replace TCP/IP and satisfy this prerequisite, the Open System Interconnection (OSI) model was introduced as network reference model for analysing data communication between hardware and software in a seven-layer system.

Osi layers:

Physical Layer Vulnerabilities includes: Loss of Power, Loss of Environmental Control, Physical Theft of Data and Hardware, Physical Damage or Destruction of Data and Hardware, Unauthorized changes to the functional environment (data connections, removable media, adding/removing resources), Disconnection of Physical Data Links, Undetectable Interception of Data and Keystroke & Other Input Logging.

Link Layer Vulnerability includes: MAC Address Spoofing (station claims the identity of another), VLAN circumvention (station may force direct communication with other stations, bypassing logical controls such as subnets and firewalls.), Spanning Tree errors may be accidentally or purposefully introduced, causing the layer two environment to transmit packets in infinite loops, In wireless media situations, layer two protocols may allow free connection to the network by unauthorized entities, or weak authentication and encryption may allow a false sense of security

Network Layer Vulnerabilities includes: Route spoofing - propagation of false network topology, IP Address Spoofing- false source addressing on malicious packets, Identity & Resource ID Vulnerability - Reliance on addressing to identify resources and peers can be brittle and vulnerable.

Transport Layer Vulnerabilities includes: Mishandling of undefined, poorly defined, or “illegal” conditions, Differences in transport protocol implementation allow “fingerprinting” and other enumeration of host information, Overloading of transport-layer mechanisms such as port numbers limit the ability to effectively filter and qualify traffic, Transmission mechanisms can be subject to spoofing and attack based on crafted packets.

Session Layer Vulnerabilities includes: Weak or non-existent authentication mechanisms, passing of session credentials such as user ID and password in the clear, allowing intercept and unauthorized use, Session identification may be subject to spoofing and hijack, Leakage of information

based on failed authentication attempts, Unlimited failed sessions allow brute-force attacks on access credentials

Presentation Layer Vulnerabilities includes: Poor handling of unexpected input can lead to application crashes or surrender of control to execute arbitrary instructions, Unintentional or ill-advised use of externally supplied input in control contexts may allow remote manipulation or information leakage, Cryptographic flaws may be exploited to circumvent privacy protections.

Application Layer Vulnerabilities includes: Open design issues allow free use of application resources by unintended parties, Backdoors and application design flaws bypass standard security controls, Inadequate security controls force “all-or-nothing” approach, resulting in either excessive or insufficient access, Overly complex application security controls tend to be bypassed or poorly understood and implemented, Program logic flaws may be accidentally or purposely used to crash programs or cause undesired behavior.

Conclusion:

According to visited literature reviews which bring about the secondary data sources and some few primary data sources, it seems that there are still difficulties in totally securing the wireless network against attacks, threats and vulnerabilities. The purpose of this study was to visit different literature in wireless network security and propose some network security solutions which will be more capable of securing wireless network compared to the existing solutions.

10. DIGITAL WATERMARKING

Introduction:

Digital Watermarking is use of a kind of marker covertly embedded in a digital media such as audio, video or image which enables us to know the source or owner of the copyright. This technique is used for tracing copyright infringement in social media and knowing the genuineness of the notes in the banking system.

Types of Watermarks:

- **Visible Watermarks** – These watermarks are visible.
- **Invisible Watermarks** – These watermarks are embedded in the media and use steganography technique. They are not visible by naked eyes.
- **Public Watermarks** – These can be understood and modified by anyone using certain algorithms. These are not secure.
- **Fragile Watermarks** – These watermarks are destroyed by data manipulation. There must be a system which can detect all changes in the data if fragile watermarks are to be used.

Digital watermarking process (Life cycle):

The information needs be embedded in the media. The signal which is embedded is the host signal and the information is called digital watermark. The process has 3 main parts:

- **Embed** – In this part, the digital signal is embedded with the digital watermark.
- **Attack** – The moment when the transmitted media is changed, it becomes a threat and is called an attack to the watermarking system.
- **Protection** – The detection of the watermark from the noisy signal which might have altered media (JPEG compression, rotation, cropping, and adding noise) is called Protection.

Applications:

- Watermarks are used in forensics. Tampered evidence is unacceptable in forensics and Watermarked images are acceptable.
- This is used by brands. The Digital Watermarking is done so that the authority of the digital media is intact.
- Digital Watermarking prevents copying of the data.
- Video editing software use watermarks so that people buy the full version of it.
- It is used in video authentication. News channels often show videos of other agencies which are watermarked. It is also used for ID card security.
- It is used for content management in social media.

Advantages:

- It is used in detecting copyright infringements of digital content.
- Watermarking is a very secure technique. The embedding of watermarks is done by a key. Anyone who wants to remove the watermark can only do this with the knowledge of the keys involved in embedding.
- The embedded version of a file is also digital in nature which can be transmitted and used easily. No change in file format ensures that there is no error or difficulty in using watermarked media.

Disadvantages:

- Watermarks that are visible are easily removed or overlaid by other watermarks.
- There still needs to be invention of more robust techniques to watermark pictures. The pictures with watermarks are easily resized and the watermarks can be cropped.
- The owners can remove watermarks easily. This means that if anyone on the owner side can easily manipulate the image and alter the watermark.

11. DIGITAL VIDEO EDITING

Introduction:

Since its inception, video editing has advanced significantly, evolving from a time-consuming analog procedure to a straightforward digital workflow. This development has transformed the craft of storytelling and fuelled the expansion of the film and television industries. The fascinating history of video editing will be examined in this article, from the early analog era to the arrival of digital technologies that have influenced how we edit and produce videos today.

The Analog Age:

Analog technology ruled the roost in the early days of video editing. An intricate and time-consuming process, editing required physically cutting and splicing film reels together. Film would be painstakingly edited, then taped together by editors to form a coherent sequence. Due to the fact that even a minor error meant having to start the entire process over, this analog method demanded patience and skill.

The Revolution of Digital:

The advent of digital technologies brought about a true transformation in video editing. The advent of digital technology did away with the need for actual tape and embraced the potential of computer-based editing techniques. Since the advent of non-linear editing (NLE) systems, editors can now work directly with video files on a computer. With this change, there was a lot more flexibility because clips could be moved around, edited, and changed without changing the rest of the sequence. Additionally, digital effects and colour correction tools gave editors the ability to improve storytelling and visuals.

Rise of Desktop Editing Software:

A wider audience now has access to video editing thanks to the development of affordable and user-friendly desktop editing software. The editing landscape was completely changed by programs like Adobe Premiere Pro, Final Cut Pro, and Avid Media Composer, which provided robust tools and user-friendly interfaces. These software options democratized video editing, allowing aspiring filmmakers, content producers, and even enthusiasts to make professional-calibre videos from the convenience of their homes.



Cloud Computing and Collaborative Editing:

The development of digital technology also made collaborative editing possible. Using cloud-based platforms, editors can now collaborate on projects from a distance and share files without any issues. This adaptability has encouraged creative collaboration across diverse geographic locations, making it simpler for teams to collaborate effectively and complete projects more successfully.

Combining CGI and Special Effects:

Advanced special effects and computer-generated imagery (CGI) were developing at the same time that video editing was evolving. The ability to seamlessly integrate visual effects, alter scenes, and create immersive environments that were previously unimaginable was made possible by the advancement of digital editing tools. The boundaries of storytelling have been pushed by the fusion of editing and visual effects, which has produced groundbreaking cinematic experiences.

AI (Artificial Intelligence) and Automation:

Automating and incorporating artificial intelligence (AI) into video editing is the newest frontier. AI-powered tools are now able to tag and analyse video, help with colour grading, offer automatic audio correction, and even make edit suggestions based on predefined styles or templates. Even though these technologies are still developing, they have a lot of potential to improve the effectiveness and creativity of video editing procedures.

Conclusion:

It has been an incredible transition from analog to digital video editing. The change has sped up creativity, made it easier to edit, and given countless writers new opportunities to tell their stories and share them with the world. We can only anticipate more innovations and opportunities in the field of video editing as technology develops, allowing us to push the boundaries of visual storytelling and produce breathtaking content that enthralls audiences all over the world.

12. MIDDLEWARE TECHNOLOGIES

Middleware is software that lies between an operating system and the applications running on it. Essentially functioning as hidden translation layer, middleware enables communication and data management for distributed applications. It's sometimes called plumbing, as it connects two applications together so data and databases can be easily passed between the "pipe." Using middleware allows users to perform such requests as submitting forms on a web browser, or allowing the web server to return dynamic web pages based on a user's profile.

Common middleware examples include database middleware, application server middleware, message-oriented middleware, web middleware, and transaction-processing monitors. Each program typically provides messaging services so that different applications can communicate using messaging frameworks like simple object access protocol (SOAP), web services, representational state transfer (REST), and JavaScript object notation (JSON).

While all middleware performs communication functions, the type a company chooses to use will depend on what service is being used and what type of information needs to be communicated. This can include security authentication, transaction management, message queues, applications servers, web servers, and directories. Middleware can also be used for distributed processing with actions occurring in real time rather than sending data back and forth.

Middleware technologies play a crucial role in facilitating communication and data exchange between different software applications and systems. There are various types of middleware technologies designed for different purposes. Here are some common types of middleware:

Message-Oriented Middleware (MOM):

Message Queue: Examples include Apache Kafka, RabbitMQ, and Apache ActiveMQ.

Message Brokers: Examples include Apache Kafka and MQTT (Message Queuing Telemetry Transport).

Remote Procedure Call (RPC) Middleware:

CORBA (Common Object Request Broker Architecture)

gRPC: A high-performance RPC framework.

Object Request Brokers (ORBs):

CORB: Commonly used for communication between objects in a distributed system.

(Distributed Component Object Model).

Database Middleware:

ODBC (Open Database Connectivity): Allows applications to interact with various database systems.

JDBC (Java Database Connectivity): A middleware technology for Java applications to interact with databases.

Web Middleware:

Web Servers: Like Apache HTTP Server and Nginx.

Application Servers: Such as Apache Tomcat, JBoss, and WildFly.

Middleware for Distributed Systems:

RMI (Java Remote Method Invocation): For distributed object communication in Java.

Distributed Object Middleware: Examples include Microsoft .NET Remoting and Java RMI.

Middleware for Service-Oriented Architecture (SOA):

ESB (Enterprise Service Bus): ESBs like Mule ESB and Apache Service Mix are used to facilitate communication between services in an SOA.

BPEL (Business Process Execution Language): Used to define and execute business processes in an SOA.

Middleware for Cloud Computing:

API Gateways: Like AWS API Gateway, which enables the creation and management of APIs in the cloud.

Serverless Computing: Services like AWS Lambda, Azure Functions, and Google Cloud Functions can be considered middleware for cloud-based, event-driven applications.

Middleware for IoT (Internet of Things):

IoT Message Brokers: Technologies like MQTT and CoAP for efficient IoT device communication.

IoT Platforms: Such as AWS IoT, Google Cloud IoT, and Microsoft Azure IoT.

Middleware for Real-Time Systems:

DDS (Data Distribution Service): Designed for real-time and embedded systems communication.

Real-Time Middleware: Used in applications where low latency and predictable response times are critical, like in industrial automation and financial trading systems.

Middleware for Content Management:

Content Management Systems (CMS): Examples include WordPress, Drupal, and Joomla, which serve as middleware for managing and delivering web content.

Middleware for Integration:

Integration Middleware: Technologies like Apache Camel and MuleSoft are used to connect and integrate diverse applications and systems.

Conclusion:

These are just some of the many types of middleware technologies available, each tailored to specific use cases and requirements in the world of software and system integration. The choice of middleware depends on the particular needs of the applications and systems you are working without are working with.

13. IMPORTANCE OF CLOUD DRIVE

Cloud drive:

Cloud Storage uses remote servers to save data, such as files, business data, videos, or images. Users upload data to servers via an internet connection, where it is saved on a virtual machine on a physical server.

Why the name cloud?

The name comes from the fact that the data gets stored on servers - in the cloud. So, I guess it's safe to assume that the cloud is a slang term used by tech industry people to describe the servers and networking infrastructures that allow users to store and access data through the internet.

Accessibility:

Cloud drives allow you to access your files from anywhere with an internet connection. This level of accessibility is particularly useful in today's globally connected world.

Data Backup and Security:

Storing data on cloud drives serves as a backup. If your computer crashes or your device is lost, your files remain safe and accessible. Reputable cloud storage services also employ robust security measures to protect your data.

Collaboration:

Cloud drives enable seamless collaboration among multiple users. You can share files and collaborate on documents in real-time, regardless of geographic locations. This is especially valuable for businesses and educational purposes.

Cost-Efficiency:

Many cloud storage services offer free plans with limited storage, making them accessible to individuals and small businesses. Paid plans with larger storage capacities are often more affordable than investing in physical storage devices.

Automatic Updates and Syncing:

Changes made to files stored in the cloud are automatically synced across all devices linked to the cloud account. This ensures that you are always working with the latest version of your files.

Scalability:

Cloud storage is scalable, meaning you can easily increase or decrease your storage capacity based on your needs. This flexibility is crucial for businesses experiencing growth or fluctua



Environmentally Friendly:

Cloud storage reduces the need for physical storage devices, leading to less energy consumption and a smaller carbon footprint.

File Organization:

Cloud drives often provide features for organizing files, such as folders, tags, and search functionalities. This helps users keep their digital files structured and easily accessible.

Cost-Efficiency:

Pay-as-you-go pricing models mean you only pay for the storage you use, reducing the upfront costs of hardware.

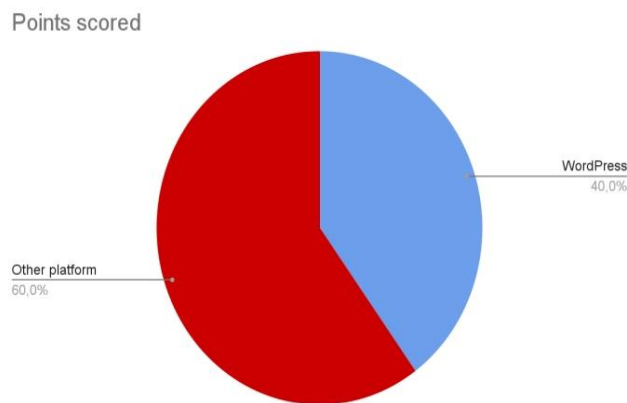
Version Control:

Many cloud drives maintain a version history, allowing you to revert to previous file versions if needed, which is beneficial for tracking changes and avoiding accidental data loss.

14. WEB SITE CREATION USING WORD PRESS

What is website creation using Word Press:

Website creation using WordPress involves the process of building and designing a website using the WordPress content management system (CMS). WordPress is a popular and user-friendly platform that allows individuals and businesses to create websites without extensive coding knowledge. Here's an overview of the steps involved in creating a website using WordPress.



Creating a website using WordPress is a popular and straightforward process. Here are the basic steps:

Get Hosting and Domain:

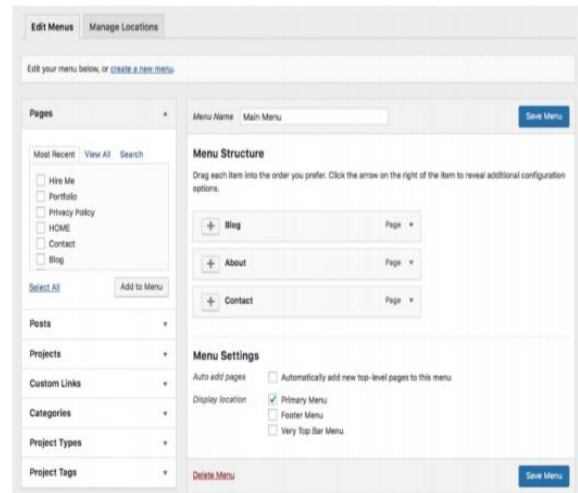
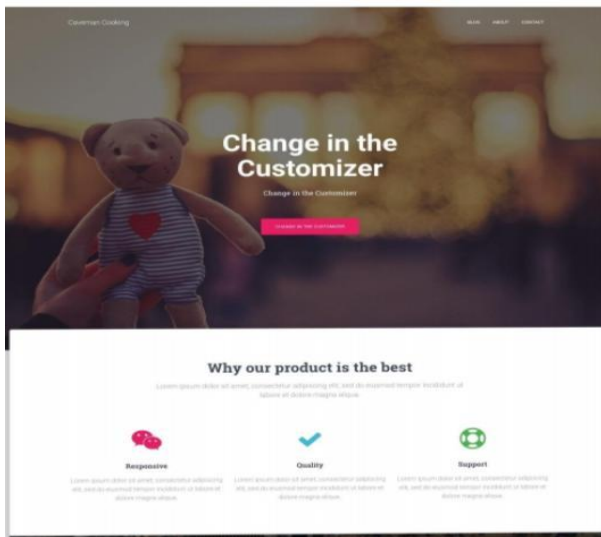
First, choose a web hosting provider and register a domain name for your website. Many hosting providers offer one-click WordPress installation.

Install WordPress:

Once you have hosting, install WordPress on your server. Most hosting providers have tools to simplify this process.

Choose a Theme:

Select a WordPress theme that suits your website's style and purpose. You can find free and premium themes in the WordPress theme repository or from third-party providers.



Customize Your Theme:

Customize the theme’s appearance and layout to match your brand and preferences. You can do this through the WordPress Customizer.

Install Plugins:

Add functionality to your site by installing plugins. There are thousands available for various purposes, from SEO optimization to e-commerce.

Create Content:

Start adding pages and posts to your website. Use the WordPress editor to format and publish your content.

Optimize for SEO:

Install an SEO plugin like Yoast SEO to optimize your site’s visibility in search engines. This involves setting meta tags, optimizing content, and more.

Set Up Navigation:

Create a navigation menu that helps users easily navigate your website. You can do this in the WordPress dashboard under “Menus.”

Test and Preview:

Before launching, thoroughly test your website for functionality and design on different devices and browsers. Use the WordPress preview feature to see how changes will look before publishing.

Launch Your Website:

Once you're satisfied with your website, make it live by changing the site's visibility settings from "Private" to "Public."

Regularly Update:

Keep your WordPress core, themes, and plugins up to date to ensure security and performance. WordPress makes this easy with automatic updates.

Back Up Your Site:

Regularly back up your website to safeguard your data. Many hosting providers offer backup solutions, and there are plugins available for this purpose as well.

Promote Your Site:

Start promoting your website through social media, email marketing, and other channels to drive traffic and engage your audience.

Monitor and Improve:

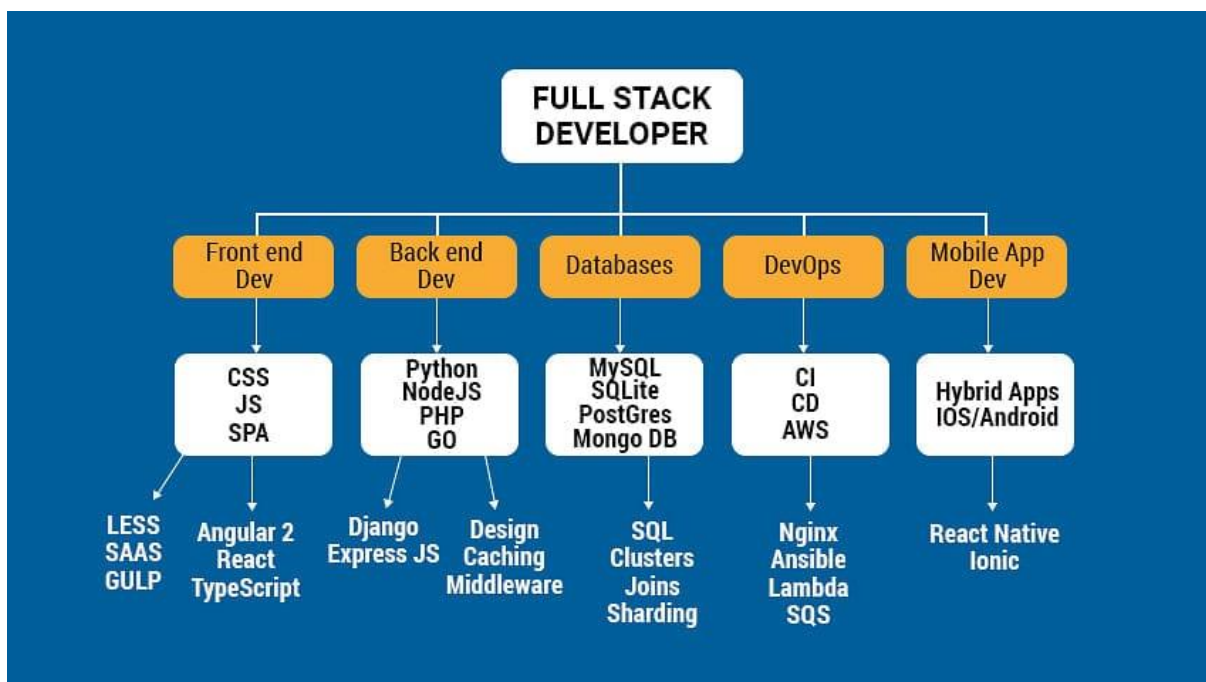
Use tools like Google Analytics to monitor website performance and user behaviour. Continuously make improvements based on data and user feedback.

Remember that WordPress has a vast community and numerous tutorials available online. If you encounter any issues or need specific guidance, you can often find answers and support through forums and documentation.

15. INTRODUCTION ABOUT FULL STACK DEVELOPER

What Is a Full-Stack Developer?

A full-stack developer is a developer or engineer who can build both the front end and the back end of a website. The front end (the parts of a website a user sees and interacts with) and the back end (the behind-the-scenes data storage and processing) require different skill sets. A full-stack developer can work in-house or at a computer development company that engineer's websites, software, and other components for other businesses.



What does a full-stack developer do?

Full-stack developers design and create websites and applications for various platforms. A full-stack developer's job description might include the following:

- Develop and maintain web services and interfaces.
- Contribute to front-end and back-end development processes.
- Build new product features or APIs.
- Perform tests, troubleshoot software, and fix bugs.
- Collaborate with other departments on projects and sprints.

Full-stack developer skills:

Full-stack developers may be creative, graphically inclined, internet- and tech-savvy, and have excellent attention to detail. You'll want to learn the following skills to have a career in full-stack development:

Front-end development is the process of creating the interface of a website. It entails coding details like drop-down menus, fonts, colours, and page layouts. Full-stack developers should also know how to work with front-end technologies like HTML, CSS, and scripting languages such as JavaScript to make websites and applications visually viable and appealing.

Why pursue a career in full-stack development?

A career in full-stack development combines creativity with analysis. As a full-stack developer, you'll have plenty of opportunities to learn and



implement innovative principles in your work.

What Are the Skills Required for a Full Stack Developer?

A full stack developer needs a firm grip on multiple frameworks, programming languages, and databases. When it comes to front-end development knowledge, a developer needs the industry-ready skills of HTML, CSS, JavaScript, jQuery, Angular, and ReactJS.

In terms of back-end development, full stack developer skills include firm grip on programming languages such as PHP, Java, Python, Node.js, and Ruby. Note that Java's popularity makes it essential that you make it a priority to acquire good Java full stack developer skills.

Advantages of Becoming a Full Stack Developer:

If you have excellent UI skills, you should be able to create and present small prototypes of the client quickly. As you gradually know more about multiple technologies, you can help other team members when they're stuck.

A full stack developer also reduces the time required for project communication because they can implement changes independently in most cases. After all, you don't have to worry about a front-end and a back-end developer having to coordinate their efforts, since the full stack developer wears both hats and has the entire project under their control.

16. SOCIAL IMPACTS OF INFORMATION TECHNOLOGY

Introduction:

Information Technology has revolutionized the way we live, work, and communicate. However, with its benefits come consequences that we must navigate. This presentation will explore the impact of IT on society and how we can harness its benefits while mitigating its negative effects.

Benefits of it:

IT has brought about numerous benefits such as increased efficiency, improved communication and access to information. These benefits have transformed industries such as healthcare, education and finance.



Consequences of it:

Along with its benefits, IT has also brought about consequences such as cybersecurity risks, job displacement, and social isolation. These consequences must be addressed to ensure that we can fully harness the benefits of IT.

Business models, commerce & market structure init:

One important way in which information technology is affecting work is by reducing the importance of distance. In many industries, the geographic distribution of work is changing significantly.

Workplace and labour market in it:

Computers and communication technologies allow individuals to communicate with one another in ways complementary to traditional face-to-face, telephonic, and written models.

Education in information technology:

Advances in information technology will affect the craft of teaching by complementing rather than eliminating traditional classroom instructions. Indeed, the effective instructor acts in a mixture of roles. In one role, the instructor is a supplier of services to the students, who might be regarded as its customers. But the effective instructor occupies another role as well, as a supervisor of students, and plays a role in motivating, encouraging, evaluating, and another developing student. For any topic there will always be a small percentage of students with the necessary background, motivation, and self-discipline to learn from self-paced workbooks or computer assisted instructions.



Private life and society:

Increasing representation of a wide variety of content in digital form results in easier and cheaper duplication of information. This has a mixed effect on the provision of content. On the one hand, content can be distributed at a lower unit cost. The rapid increase in computing and communications power has raised considerable concern about privacy both in the public and private sector.

Conclusion:

The ongoing computing and communications revolution has numerous economic and social impacts on modern society and required serious social science investigation in order to manage its risks and dangers. Such work would be valuable for both social policy and technology design. Decisions have to be taken carefully. Many choices being made now will be costly to modify.

17. IMPORTANCE OF AMAZON WEB SERVICES

Amazon Web Services (AWS) is a comprehensive cloud computing platform provided by Amazon. It offers a wide range of services, including computing power, storage, databases, networking, analytics, machine learning, security, and more. AWS allows businesses and individuals to access and utilize these services on a pay-as-you-go basis, eliminating the need for upfront infrastructure investments. It's a popular choice for building and deploying applications, managing data, and scaling resources easily.



The AWS Ecosystem

At its core, AWS provides an extensive suite of services that cater to a myriad of needs. Computing power is harnessed through Amazon Elastic Compute Cloud (EC2), enabling users to scale virtual servers according to demand. Amazon Simple Storage Service (S3) offers scalable and secure object storage, while Amazon Relational Database Service (RDS) simplifies the management of relational databases.

Challenges and Considerations

- Complexity: The breadth of AWS services can lead to a learning curve for users, requiring investment in training and expertise.
- Vendor Lock-In: Extensive reliance on AWS services could potentially limit the portability of applications and data.

Benefits of AWS

- **Scalability and Flexibility:** AWS allows users to scale resources up or down based on demand, enabling businesses to avoid over-provisioning and reduce costs.
- **Cost-Efficiency:** The pay-as-you-go model eliminates the need for upfront capital expenditures, making it affordable for startups and established enterprises alike.
- **Global Reach:** With data centres in multiple regions, AWS ensures low-latency access to services on a global scale.
- **Security and Compliance:** AWS provides robust security features and compliance certifications, addressing concerns about data protection and regulatory requirements.



IMPACT ON BUSINESS AND TECHNOLOGIES

Amazon Web Services (AWS) has exerted a transformative impact on both businesses and technologies, revolutionizing the way enterprises operate. Its pioneering cloud infrastructure and scalable services have enabled businesses to innovate faster, scale seamlessly, and reduce operational costs. By democratizing access to sophisticated technologies like machine learning and data analytics, AWS has accelerated digital transformation across industries. Startups benefit from its pay-as-you-go model, levelling the playing field for innovation.

18. INTERCONNECTION OF COMPUTER NETWORK

Introduction:

The interconnection of computer networks has revolutionized the way we communicate, collaborate, and access information. It has paved the way for a globally connected world, where individuals, businesses, and governments can interact seamlessly, regardless of geographical boundaries. This essay explores the significance of computer network interconnection, its underlying technologies, and the far-reaching impact it has on modern society.



The Evolution of Computer Network Interconnection:

The concept of interconnecting computer networks dates back to the U.S. Department of Defence developed the ARPANET, a pioneering network that served as the foundation for the modern-day internet. Over the decades, advancements in networking technologies, such as packet switching and the development of communication protocols like TCP/IP, laid the groundwork for a robust and scalable global network.

The Internet, a vast interconnection of networks, emerged in the 1990s, becoming the catalyst for the digital age. It enabled the exchange of data, services, and information on an unprecedented scale.

Underlying Technologies of Interconnection:

Routers and Switches: Routers and switches are fundamental components in the interconnection of computer networks. Routers determine the best path for data packets to travel between networks, while switches facilitate communication within local networks by directing data to the intended destination. Together, they ensure efficient and secure data transmission.

Protocols: Communication protocols, such as TCP/IP, enable the standardization of data exchange across heterogeneous networks. These

protocols define rules for data formatting, addressing, routing, and error detection, ensuring seamless interconnectivity among diverse systems.

Network Security: With interconnected networks comes the need for robust security measures. Firewalls, encryption, virtual private networks (VPNs), and intrusion detection systems (IDS) play a pivotal role in safeguarding sensitive information and preventing unauthorized access.



Impact on Society:

Communication and Collaboration: The interconnection of computer networks has redefined how people communicate and collaborate. Social media platforms, messaging apps, and video conferencing tools have brought individuals closer, bridging geographical gaps and fostering global friendships.

Conclusion:

The interconnection of computer networks has transformed the world into a closely-knit global community. Through continuous technological advancements, these networks have become faster, more reliable, and more secure. As we move forward, it is crucial to address challenges like cyber security threats and digital divides to ensure that the benefits of interconnected networks are enjoyed by all.

19. BASICS OF CLOUD COMPUTING

Cloud computing has emerged as a transformative technology that revolutionizes the traditional way of storing, accessing, and processing data. It allows businesses and individuals to quickly and efficiently leverage the power of remote servers over the internet, enabling scalable resources, increased flexibility, and cost savings. In this article, we will provide a detailed explanation of the basics of cloud computing, along with an accompanying image to enhance understanding.



Essential Components of Cloud Computing:

Infrastructure as a Service (IaaS): IaaS provides virtualized computing resources, including servers, storage, and networks, to users over the internet. Users have full control over the operating systems, applications, and databases hosted on the infrastructure.

Platform as a Service (PaaS): PaaS offers a platform for developers to build, deploy, and manage applications without the complexity of infrastructure management. It provides a ready-made environment for programming and testing applications.

Software as a Service (SaaS): SaaS allows users to access applications and software hosted on cloud servers. It eliminates the need for installing and maintaining software on individual devices, providing a hassle-free experience.

Benefits of Cloud Computing:

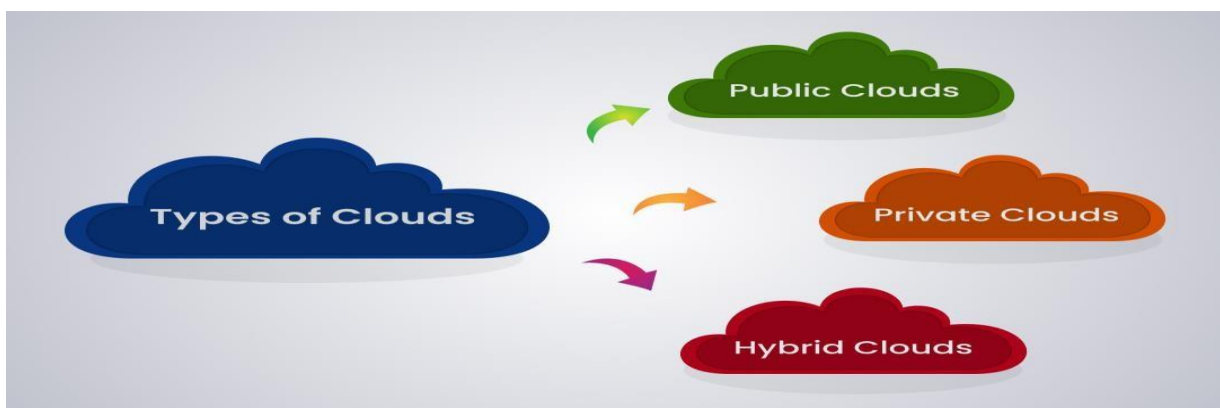
Scalability: Cloud computing offers the ability to scale computing resources up or down based on demand. It allows businesses to easily accommodate traffic spikes, adjust resource allocation, and respond to changing needs without major investments in hardware or infrastructure.

Security: Cloud providers invest heavily in security measures to protect data from unauthorized access and breaches. Encryption, firewalls, and multi-factor authentication are implemented to ensure the confidentiality and integrity of data. Types of Cloud Deployments:

Public Cloud: Public clouds are owned and operated by third-party service providers, who deliver computing resources and services to multiple organizations or individuals. Examples include Amazon Web Services (AWS), Microsoft Azure, and Google Cloud Platform.

Private Cloud: Private clouds are dedicated, single-tenant environments built specifically for one organization. They can be located on-site or hosted by a third-party provider, offering enhanced control, security, and customization options.

Hybrid Cloud: Hybrid clouds combine both public and private cloud



infrastructure by allowing data and applications to be shared between them.

Conclusion:

Cloud computing offers tremendous opportunities for businesses and individuals to leverage the power of remote servers, enhance productivity, and reduce costs. Understanding the basics of cloud computing is essential for anyone considering its adoption.

20. VIRTUAL REALITY AND AUGMENTED REALITY

Introduction:

Virtual reality (VR) and augmented reality (AR) are two groundbreaking technologies that have revolutionized the way we interact with the digital world. Both these technologies offer immersive experiences, blurring the line between the virtual and real environments. In this essay, we will level into the concepts, application, and potential impact of VR and AR on various aspects of human life.

Understanding Virtual Reality:

Virtual reality refers to a computer-generated simulation that allows users to experience and interact with a three-dimensional, artificial environment. It typically involves wearing a VR headset, which encompasses the user's vision and sometimes includes handheld controllers for interaction. VR application's range from gaming and entertainment to education, training, and therapy.



Applications of Virtual Reality:

In the gaming industry, VR has opened up new possibilities for players to immerse themselves in a life like, interactive environment. Furthermore, VR has found its way into education, enabling students to experience historical events, explore distant places, and grasp complex scientific concepts in a more engaging manner.

The Advancement of Augmented Reality:

Augmented reality, on the other hand, involves overlaying digital content onto the real world, enhancing the user's perception of reality. Unlike VR, AR does not require a completely enclosed environment, making it more versatile and accessible. Common AR applications include mobile games like through apps like Google Maps.

The Convergence of VR and AR:

While VR and AR are distinct technologies, there are instances where they converge to create mixed reality (MR) experiences. Mixed reality involves blending virtual elements with the real world and enables users to interact with both simultaneously. This convergence has significant potential in fields like architecture, where clients can through virtual buildings overlaid onto real construction sites.



Conclusion:

Virtual reality and augmented reality have transformed the way we perceive and interact with the world. From immersive gaming experiences to practical applications in education, training, and industry, these technologies have immense potential to shape the future.

21. VOICE MORPHING

Introduction:

Voice morphing is a technique for modifying a source speaker's speech to sound as if it was spoken by some designated target speaker. Most of the recent approaches to voice morphing apply a linear transformation to the spectral envelope and pitch scaling to modify the prosody.

Voice morphing technology enables a user to transform one person's speech pattern into another person's pattern with distinct characteristics. Image morphing, speech morphing preserves the shared characteristics of the starting and final signals, while generating a smooth transition between them.

Keywords- Voice morph, Phase vocoder, Speech The two broad categories of pitch-estimation algorithms are time-domain algorithms and frequency-domain algorithms. Time domain algorithms attempt to determine pitch directly from the speech waveform.

Our voice morphing system consists of three stages: the training stage, the conversion stage and the synthesis stage. The flow diagram of the proposed voice morphing system.

Morphing is a special effect in motion pictures and animations that changes (or morphs) one image or shape into another through a seamless transition. Traditionally such a depiction would be achieved through dissolving techniques on film.

In principle, the morphing technology integrated into an aircraft wing concerns an automated shape adaptation to reach the best aerodynamic efficiency given a flying condition. A mechanism, usually inside the wing, adapts the shape following a set of inputs.

By using advanced compositing techniques, visual effects artists can seamlessly blend together different elements to create realistic and believable effects. For example, they might use morphing to transform an actor's face into that of a monster or alien creature.

There are two parts in the image morphing implementation. The first part is warping and the second part is cross-dissolving.

Which algorithm is used in speech recognition? Conventional speech recognition systems utilize Gaussian mixture model (GMM) based hidden Markov models (HMMs) to represent the sequential structure of speech signals.

A speech recognition algorithm or voice recognition algorithm is used in speech recognition technology to convert voice to text. Speech recognition systems have several advantages: Efficiency: This technology makes work processes more efficient.

In choral music arrangements each of these voices is represented by a letter—S for soprano, A for alto, T for tenor, and B for bass. Most choral music is arranged SATB, using a voice part from each of the four major classifications.

A selection of singers shares their skills from the lowest voice type to the highest, demonstrating the power of the bass, baritone, tenor, mezzo-soprano, countertenor, and soprano voices.

22. TRACKING AND POSITIONING OF MOBILES IN TELECOMMUNICATION

Introduction:

Various location-based services in wireless communication networks depend on mobile positioning. Mobile positioning technology has become an important area of research and it is applied to the key reasons for the tremendous research interest in personal positioning technologies in cellular networks. The evolution to location-dependent services and applications in wireless systems continues to require the development of more accurate and reliable mobile positioning technologies.

Network-based Mobile Positioning Technology:

The Network based technology is used for the mobile network, in conjunction with network-based position determination equipment in which it is used to position the mobile device. This technique utilizes the service provider's network infrastructure to identify the location of the handset. The advantage of Network-based techniques is that it can be implemented without affecting the handsets. These are basically the Multilateral (multiple Base Stations measuring simultaneously), unilateral (MS measures multiple BSs) and examples are the Angle of Arrival (AOA) and Time of Arrival (TOA) / Time Difference of Arrival (TDOA) approaches.

Handset-based Mobile Positioning Technology:

This technique determines the location of the handset by putting its location by cell identification, signal strengths of neighbouring cells etc. And the handset itself is the primary means of positioning the user, although the network can be used to provide assistance in acquiring the mobile device and/or making position estimate determinations based on measurement data.

Need for mobile tracking:

Mobile Phone Tracking refers to the achieving of the current position of a mobile phone in a moving or stationary condition. Mobile tracking locates the distance between mobile telephone network and the base stations. It determines the arrival time of the signals at base stations and the location of mobile telephone.

- Emergency service for subscriber safety.
- Location sensitive billing.
- Cellular Fraud detection.
- Intelligent transport system services.
- Efficient and effective network performance and management.



Global positioning system (GPS):

GPS (Global Positioning System) tracking systems that provide independent mobile tracking through the device. GPS tracking works via a network of satellites in orbit to determine the location and time of the device. The data can only be sent when there are four or more satellites within line of sight of the device. GPS tracking services are often referred to as location-based services (LBS), as well.

Conclusion:

Our proposal is advantageous in that the location of a mobile telephone can be accurately tracked even in the multi-path fading and the NLOS environment, by using more accurate tracking curves connecting the intersection points among circles with the radii being the distances between corresponding BSs and the mobile telephone in a cellular mobile communication system.

23. FACE BOOK THRIFT

Introduction:

Facebook Thrift is an open-source software framework developed by Facebook for building scalable and efficient cross language services. Thrift is designed to simplify the development of high-performance and language-agnostic communication protocols, enabling seamless communication between different systems and programming languages. Here are some key points about Facebook Thrift:

Cross-Language Support:

Thrift allows developers to define data types and service interfaces using a simple interface definition language (IDL) and then generate code for multiple programming languages, making it easy to create services that can be accessed from different platforms and languages.

Efficient Serialization:

Thrift uses a compact binary protocol for data serialization, which is highly efficient and minimizes the size of data sent over the network. This is crucial for improving the performance of distributed systems.

Code Generation:

Thrift provides a code generation tool that generates client and server code in various programming languages based on the IDL specifications. This minimizes the effort required to create interfaces and data structures in different languages.

Scalability:

Thrift is designed to support high levels of concurrency and is well-suited for building large-scale, high-performance systems. It can handle a high volume of requests while maintaining low latency.

Extensibility:

The Thrift IDL allows you to define data structures, services, and message types, making it suitable for a wide range of use cases, including remote procedure calls, message passing, and data storage.

Supported Languages:

Thrift supports code generation for various programming languages, including but not limited to C++, Java, Python, Ruby, and more.

In summary, Facebook Thrift is a versatile and efficient framework for building cross-language services, enabling seamless communication and data exchange between systems developed in different programming languages.

24. USAGE OF DIGITAL TRUST

Introduction:

Digital trust involves creating a secure and dependable digital space for transactions and interactions. It includes strong security measures, data protection, reliable services, and accountability. Building trust leads to long-term relationships, increased revenue, and growth.

The Four Paragons of Digital Trust:

Security: Security is a fundamental component of digital trust. Customers need to know that their personal information is safe and secure when they interact with a business online. This means implementing strong security measures to protect against cyber threats, using encryption to safeguard sensitive data, and ensuring that all data is stored securely.

Transparency: Transparency is also essential to digital trust. Customers want to know how their personal data is being collected, stored, and used. Businesses must be transparent about their data collection practices and provide clear and concise privacy policies that outline how customer data will be used.

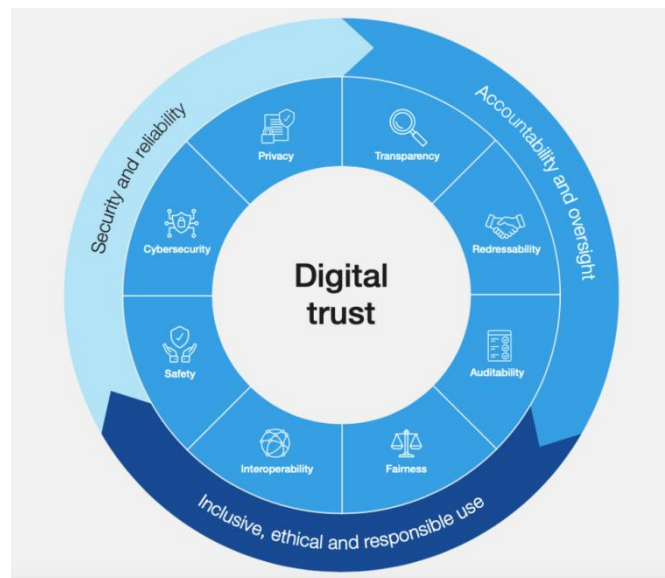
Reliability: Reliability is another key component of digital trust. Customers want to know that they can rely on a business to deliver on its promises. This means providing accurate product information, delivering products and services on time, and providing excellent customer service.

User Experience: Customers expect a seamless and frictionless experience when they interact with a business online. This means providing a user-friendly website or mobile app, ensuring that page's load quickly, and making it easy for customers to complete transactions.

Impact of Digital Trust on Customer Behaviour:

When customers trust a business, they feel more comfortable sharing their personal information and making purchases online. This trust can be inspired by a business's strong data protection measures, which make customers more likely to engage with digital marketing and personalized services.

Overall, digital trust plays a significant role in shaping consumer behaviour, including their willingness to share information and make online purchases.



The Impact of Digital Trust on Brand Reputation:

A business’s reputation is incredibly important, and digital trust can affect how people view a brand. If a business has a data breach or other security problem, it can harm the brand’s reputation and make customers less likely to trust it.

How to Build Digital Trust:

- Implement AI-based monitoring of data.
- Leverage data trusts.
- Explore the potential of blockchain.
- Build customer trust.
- Invest in talent and infrastructure.

Conclusion:

Digital trust is a crucial aspect of modern businesses to establish a strong foundation of trust and ensure that customers feel confident in interacting and transacting with a business via technology. The four pillars of digital trust are security, transparency, reliability, and user experience, and businesses must prioritize them to enhance their digital reputation and build long-term customer loyalty.

25. APPLICATIONS OF SMARTER DEVICE

A smart device is an electronic device, generally connected to other devices or networks via different wireless protocols (such as Bluetooth, Zigbee, near-field communication, Wi-Fi, Near Link, Li Fi, or 5G) that can operate to some extent interactively and autonomously.

Several notable types of smart devices are smartphones, smart speakers, smart cars, smart thermostats, smart doorbells, smart locks, smart refrigerators, phablets and tablets, smart watches, smart bands, smart keychains, smart glasses, and many others. The term can also refer to a device that exhibits some properties of ubiquitous computing, including—although not necessarily—machine learning.

Smart devices can be designed to support a variety of form factors, a range of properties pertaining to ubiquitous computing and to be used in three main system environments: physical world, human-centred environments, and distributed computing environments. Smart homes indicate the presence of sensors and some detection devices, appliances, and a database to control them.

- A set of system hardware & software IT resources. This set is usually static, fixed at design time.
- Dynamic component-oriented resource extensions & plug-ins (plug and play) of some hardware resources.
- Remote external service access and execution.
- Local, internal autonomous service execution.
- Access to specific external environments: human interaction, physical world interaction and distributed ICT / virtual computing interaction.

Common types of smart devices include:

Tab and pad type smart devices that often act as personalized smart mobile devices

Weiser's vision for ubiquitous computing can be summarized in terms of two core properties:

- Devices need to be networked, distributed and transparently accessible.
- Human–computer interaction with devices is hidden to a degree from its users.
- It is proposed that there are two additional core types of properties for ubiquitous computing system.
- Devices can operate to some extent autonomously, i.e., without human intervention, be self-governed.
- Handle incomplete and non-deterministic interactions.
- Cooperation and competition between members of organizations.
- Richer interaction through sharing of context, semantics and goals, etc.

However, it is hard to fix a closed set of properties that define all ubiquitous computing devices because of the sheer range and variety of ubiquitous computing research and applications. Rather than to propose a single definition for ubiquitous computing, a taxonomy of properties for ubiquitous computing has been proposed, from which different kinds or flavours of ubiquitous systems and applications can be composed and described.

26. CHILD SAFETY WEARABLE DEVICE

Introduction:

At the movement there are many wearables in the market which help to track the daily activity of children and also help to find the child using Wi-Fi and Bluetooth services present on the device. But Wi-Fi and Bluetooth appear to be unreliable medium of communication between the parent and child. So, there must be an SMS text enabled communication medium between the child's wearable and the parent as the environment for GSM mobile communication is almost present everywhere. The parent can send a text with specific keywords such as "LOCATION ", "TEMPERATURE ", "UV ", "SOS ", "BUZZ ", etc., the wearable device will reply back with a text containing the real time accurate location of the child which upon tapping will provide directions to the child's location on Google maps app and will also provide the surrounding temperature, UV radiation index so that the parents can keep track if the temperature or UV radiation is not suitable for the child.

Distress Alarm Buzzer:

The scenario, if a child is separated from his/her parents. The parent can locate their child by sounding a very loud alarm on the wearable. To achieve this, grove seed studio buzzer was used, which has a piezoelectric module which is responsible for emitting a strong tone upon the output being set to HIGH. The grove buzzer module is activated upon sending an SMS text with the keyword "BUZZ" from a cell phone. Also, this buzzer works similar to the SOS led by alerting the people nearby with the distressed tone that the child might be lost and is in need of assistance. The buzzer is connected to the D4 digital port of the base shield.



Temperature Sensor:

In order to measure the temperature of the surroundings of the child, a seed studio Grove temperature sensor was used. The sensor module is equipped with their mister for measuring the ambient temperature and the fluctuations with high accuracy. The observable temperature detectability for this sensor ranges from -40 degree Celsius to -125 degree Celsius and the precise accuracy for this device range from +1.5 degree Celsius to -1.5 degree Celsius. The temperature is connected to the Arduino Uno and GSM shield using a Grove base shield which contains eight digital ports ranging from D1 to D8, four analogue ports ranging from A0 to A3 and 4 12C ports. Therefore, the temperature sensor is connected to the A2 analogue port of the base shield. The temperature value is stored in a string get Temp(a), where “a” is the integer type. Hence the get Temp(a) is called by the GSM module upon receiving the proper SMS keyword “TEMPERATURE” by the user’s smart phone.

SOS Light:

The purpose of the SOS light is to be able to alert the people nearby that the child might be in distress since the light will be flashing the universal SOS light symbol which many people nowadays know for to be a sign for help. This can be activated by the parent itself by sending an SMS text with the keyword "SOS" to the child's wearable which will activate the SOS light flashing. The SOS light works on the principal of Morse code in which "S" stands for three short dots and the "0" stands for three long dashes. Since a very long time, the SOS signal has been universally known for being the sign of distress and help. The SOS signal is referred to by all security personals, who if find the child to be missing can act and help locate the parents with surplus resources present at their disposal.

Conclusion:

The child safety wearable device is capable of acting as a smart IOT device. It provides parents with the real-time location, surrounding temperature, UV radiation index and SOS light along with Distress alarm buzzer for their child's surroundings and the ability to locate their child or alert bystanders in acting to rescue or comfort the child.

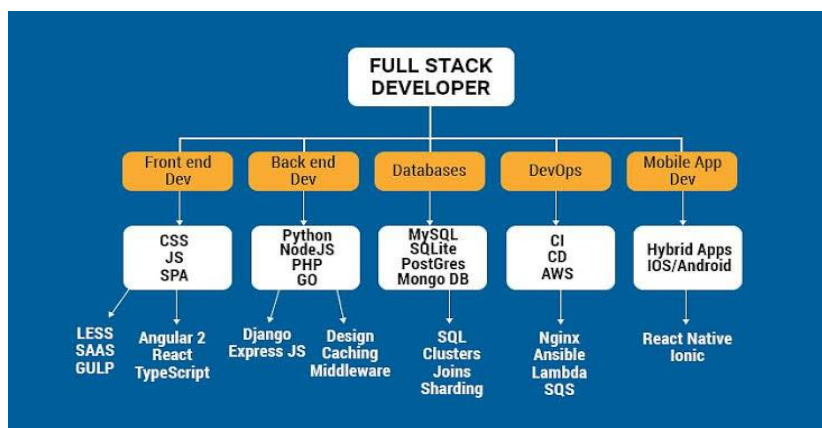
27. USAGE OF FULL STACK DEVELOPER

Full stack developer:

A full stack web developer is an individual who is capable for developing both client and server-side software. Full stack is a collection of tools, technologies, and programming languages for develop and deploy projects. A full stack developer has the skills and ability to complete a product independently. They can handle the work of front-end UI programming and development, database and servers.

Database management system:

A full stack developer writes code that is used to perform relational mapping to fetch data from the database. Some popularly used DBMS MySQL, SQL SERVER and PostgreSQL, MongoDB, and Oracle Database.

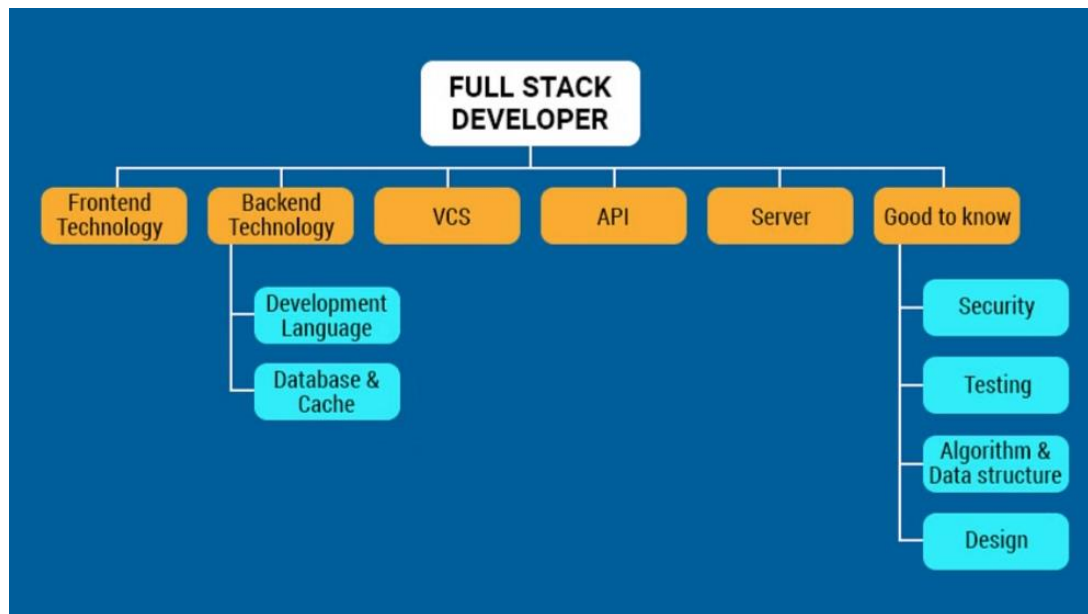


Creating better user experience:

Knowing how the user thinks when going through an interface is important. Creating better user experiences involves minimizing user actions as impossible, providing helpful/ guiding messages and more.

Testing and Debugging:

A full stack developer is usually tasked with checking the design algorithm, checking for correctness, going through for possible bugs, and code review.



Front-end development:

It is the process of creating the interface of a website. It entails coding details like drop-down menus, fonts, colours, and page layouts. Full-stack developers should also know how to work with front-end technologies like HTML, CSS, and scripting languages such as JavaScript to make websites and applications visually viable and appealing. If you want to transition into full-stack development from back-end development.

Back-end development:

This skills entail using back-end programming languages like Python, PHP, Ruby on Rails, and CakePHP and understanding how algorithms and business logic work.

Web Design:

Web design includes using software such as Photoshop to create and it'll be helpful to familiarize yourself with basic UI (user interface) design principles to help you create navigational elements, backgrounds, and audio and video elements.

28. CRYPTO WATERMARKING

Introduction:

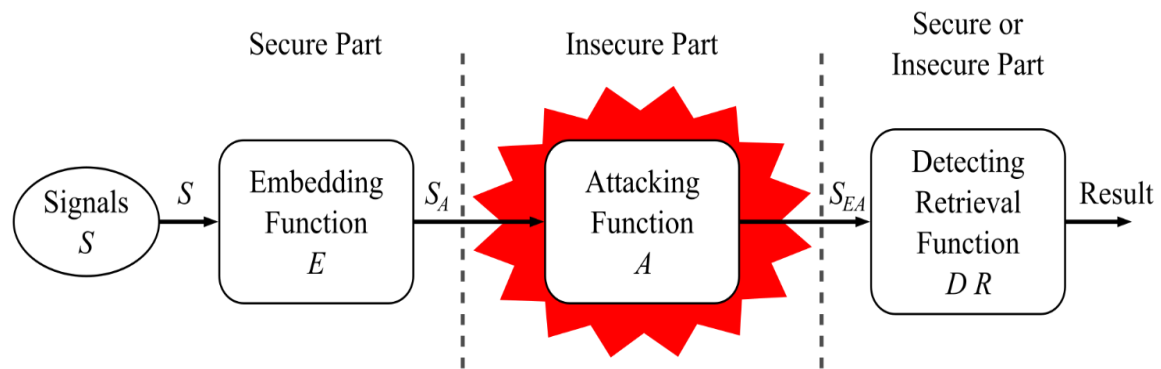
A cryptographic watermark and the patient's data are hidden in the cover image before being transmitted over vulnerable public networks. On the receiver's side, the watermarked image is handled by the extraction procedure in order to extract the cryptographic watermarks and the embedded medical data. Crypto-watermarking helps in giving the suitable data installed in the images without setting out a freedom by legitimate conveyance of images to the intended proprietor.

Applications:

Digital watermarking may be used for a wide range of applications, such as:

- Copyright protection
- Source tracking (different recipients get differently watermarked content)
- Broadcast monitoring (television news often contains watermarked video from international agencies)
- Video authentication
- Software crippling on screen casting and video editing software programs, to encourage users to purchase the full version to remove it.
- ID card security
- Fraud and Tamper detection.
- Content management on social networks.

The information to be embedded in a signal is called a digital watermark, although in some contexts the phrase digital watermark means the difference between the watermarked signal and the cover signal. The signal where the watermark is to be embedded is called the host signal. A watermarking system is usually divided into three distinct steps, embedding, attack, and detection. In embedding, an algorithm accepts the host and the data to be embedded, and produces a watermarked signal.



Classification:

A digital watermark is called robust with respect to transformations if the embedded information may be detected reliably from the marked signal, even if degraded by any number of transformations. Typical image degradations are JPEG compression, rotation, cropping, additive noise, and quantization.

Robust imperceptible watermarks have been proposed as a tool for the protection of digital content, for example as an embedded no-copy-allowed flag in professional video content.

Robustness:

A digital watermark is called "fragile" if it fails to be detectable after the slightest modification. Fragile watermarks are commonly used for tamper detection (integrity proof). Modifications to an original work that clearly are noticeable, commonly are not referred to as watermarks, but as generalize.

Embedding method:

A digital watermarking method is referred to as spread-spectrum if the marked signal is obtained by an additive modification. Spread-spectrum watermarks are known to be modestly robust, but also to have a low information capacity due to host interference.

Conclusion:

As we look ahead, the importance of crypto watermarking is set to grow in our increasingly digital world. Whether in protecting the rights of content creators, preventing unauthorized distribution, or ensuring data integrity, the role of cryptographic watermarks is pivotal.

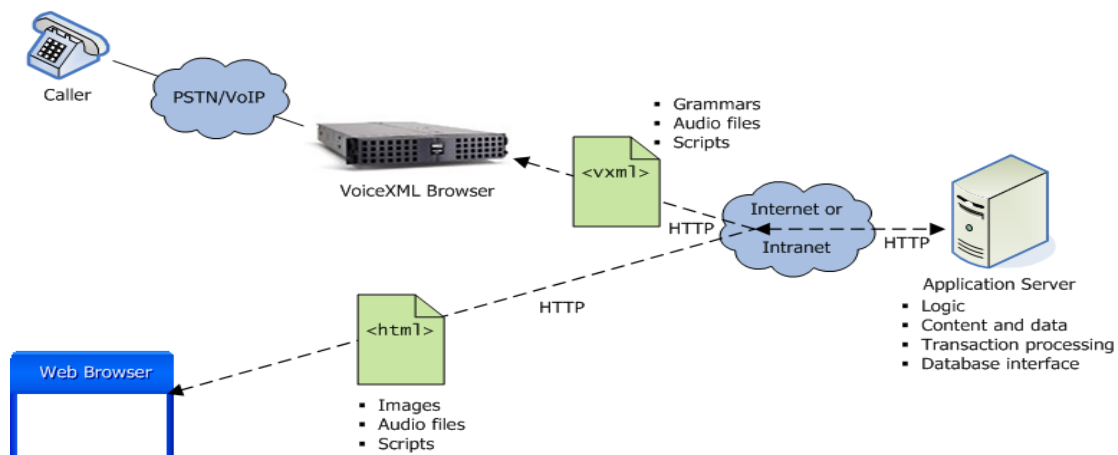
29. VOICE XML

Introduction:

Voice XML is an Extensible Markup Language (XML) standard for storing and processing digitized voice, input recognition and defining human and machine voice interaction. Voice XML uses voice as an input to a machine for desired processing, thereby facilitating voice application development. A voice-based application is managed by a voice browser.

Technology:

VoiceXML relies heavily on voice-based technologies and the underlying Internet infrastructure. While HTML is based on an assumption of a graphical web browser with a display output and keyboard/mouse input, VoiceXML caters to a voice browser with audio output and audio/keyboard input. The audio input is analysed by the voice browser's built-in speech recognizer, and audio output is generated either from a pre-existing database of recordings or from artificial speech synthesized by the voice browser's text-to-speech system. A voice browser runs on a specialized voice gateway node that can support several hundred simultaneous callers, and can be accessed through any telephone line. The gateway node is connected to both the Internet and to a PSTN (Public Switched Telephone Network). VoiceXML has tags that instruct the voice browser to provide various speech services such as speech recognition, speech synthesis, dialog management, and audio playback. HTTP is the most commonly used transport protocol for fetching VoiceXML pages. Applications may use static VoiceXML pages or generate dynamic VoiceXML pages using an application server like Tomcat, WebLogic, IIS, or WebSphere.



Voice XML Architecture

VoiceXML connects to a telephone network on one side, and a TCP/IP network and the corresponding application server on the other side. A typical VoiceXML-based system consists of four main components:

- **Telephone Network:** VoiceXML can work with both a PSTN network as well as a VoIP packet network.
- **Application Server:** The application server is typically a web server that hosts the VoiceXML application and the business logic.
- **VoiceXML Gateway:** A VoiceXML gateway consists of a VoiceXML interpreter, which is integrated with speech resources (automatic speech recognition, text-to-speech, and audio playback) and telephony resources (DTMF, call control). A VoiceXML gateway downloads the applications from the application server and interprets them.
- **TCP/IP Network:** The underlying network of a VoiceXML application can be a LAN, WAN or even the public Internet.

Voice XML's Future:

In Version 3.0 using the proposed W3C Natural Language Semantics Markup Language to represent recognition results. Ability to centrally define grammar and audio resources and then reference it by the 'id' attributes elsewhere. Providing standardized audio playback controls (analogous to CD player controls) for changing the speed and volume of the audio, and for moving back and forward in the audio stream.

Providing additional security features such as speaker identification and verification; other features include video capture and replay, and a more powerful prompt queue. Support for new multimodal markup standards by modularization of VoiceXML; enables XHTML to be used as a container for mode-specific markup (XHTML for visual, VoiceXML for voice, InkXML for ink, etc.), so that the modes' interaction with each other can be defined using XML Events.

Conclusion:

Voice XML has become a standard. All in one solution available. Reduces dialogue system development time. Additional functions can be easily implemented. Develop our own dialogue system with free VoiceXML browser.

30. ROBOTIC PROCESS AUTOMATION (RPA)

Robotic process automation (RPA):

Robotic process automation (RPA) is the use of software with artificial intelligence (AI) and machine learning capabilities to handle high volume, repeatable tasks that is previously required humans to perform. These tasks can include queries, calculations, and maintenance of records and transactions. RPA technology, sometimes called a software robot or bot, mimics a human worker, logging into applications, entering data, calculating and completing tasks and logging out.

Evolution of RPA:

RPA evolved from three key technologies: screen scraping, workflow automation and artificial intelligence. Screen scraping is the process of collecting screen display data from a legacy application so that the data can be displayed by a more modern user interface.



Benefits of RPA:

- Enabling better customer service.
- Ensuring business operations and processes comply with regulations and standards.
- Providing improved efficiency by digitising and auditing process data.
- Creating cost savings for manual and repetitive tasks.
- Enabling employees to be more productive.

- Allowing processes to be completed much more rapidly.



Application of RPA:

- Customer service: RPA can help companies offer better customer service by automating contact centre tasks, including verifying e-signatures, uploading documents and verifying information for automatic approvals or rejections.
- Accounting: Organisations can use RPA for general accounting, operational accounting, transactional reporting and budgeting.
- Supply chain management: RPA can be used for procurement, automating order processing and payments, monitoring inventory levels and tracking shipments.

31. DATABASE MANAGEMENT SYSTEM

What is a DBMS?

A database management system (DBMS) is middleware that allows programmers, database administrators (DBAs), software applications and end users to store, organize, access, query and manipulate data in a database.

DBMSs are important because they provide efficient and reliable mechanisms for organizing, managing and using vast amounts of data while also ensuring data integrity and providing other data management benefits.

In the enterprise, database management systems provide database administrators (DBAs) with a structured framework that facilitates data sharing among different departments, teams and applications. The DBMS provides employees with controlled and organized access to data that they can use to drive innovation and help their company maintain a competitive edge.

It was developed by Charles W. Bachman and his team at General Electric (GE) in the late 1960s. IDS was a hierarchical DBMS that organized data in a tree-like structure, with parent-child relationships between records. It allowed users to store, retrieve, and manage data in a structured manner

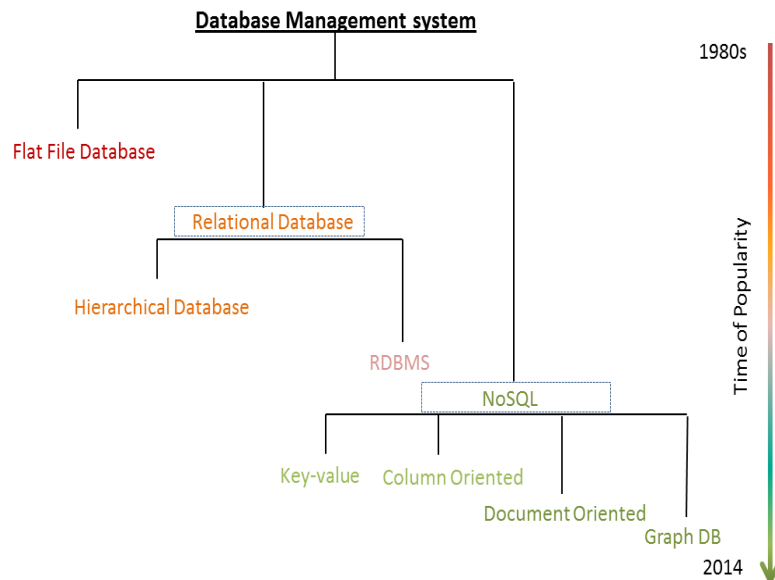
Year	Event
1964	Development of the first database, an Integrated Data Store (IDS), by Charles Bachman at General Electric.
1966	IBM introduces the Information Management System (IMS), a joint development with Rockwell and Caterpillar.
1970	Edgar F. Codd introduces the relational model in a paper titled “A Relational Model of Data for Large Shared Data Banks“.
1974	The Structured Query Language (SQL) is created.
1976	Peter Chen introduces the Entity-Relationship Model in his paper “The Entity-Relationship Model – Toward a Unified View of Data“.
1979	Oracle releases the first commercial relational database that uses SQL.

1980	IBM introduces System R, the SQL-based relational database management system.
1981	SQL/DS, the first full-function DBMS to run on personal computers, is released by IBM.
1983	The first version of DB2 by IBM is released for mainframes.
1986	The Object-Oriented Database System Manifesto is published, giving a significant push to the development of object-oriented databases.
1996	PostgreSQL, one of the first open-source relational database management systems is launched.
1998	MySQL, another significant open-source RDMS, is released for Windows 95 and NT.
1998	Microsoft launches SQL Server 7.0, a complete rewrite of their DBMS.
2000	Internet startups embrace XML databases.
2004	The term “NoSQL” gains popularity, leading to a new generation of non-relational, distributed databases.
2006	Google publishes a paper on Bigtable, its internal NoSQL database, influencing a new wave of open-source NoSQL databases
2012	Amazon introduces DynamoDB, a proprietary NoSQL database.
2013	Foundation DB, a distributed database designed to handle large volumes of structured data, is released.
2017	Google announces Spanner, a globally distributed database.
2020s	Continued development and innovation in DBMS technology, with focus on cloud-native databases, edge databases and improvements in AI integration for database management. Blockchain databases also become a significant topic of interest.

Database vs DBMS:

The terms “database” and “database management system” are often used interchangeably in casual conversations. That’s probably because when end users interact with a database, they are not aware of the underlying DBMS and its distinct role in managing data. To add to the confusion, in some cases the DBMS is embedded directly into application code. This makes it even less apparent that a separate system is involved.

To differentiate between the two terms and use them correctly, it’s helpful to understand their respective roles and functionalities: A database is a structured collection of data. The database management system is the software that developers, end users and applications use to interact with a database.



Database:

Normalization No Normalization is a database design technique that reduces data redundancy and eliminates undesirable characteristics like Insertion, Update and Deletion Anomalies. Normalization rules divides larger tables into smaller tables and links them using relationships.

32. GSM SECURITY AND ENCRYPTION

Introduction:

Mobile phones are used on a daily basis by hundreds of millions of users, over radio links. Emerging wireless networks share many common characteristics with traditional wire-line networks such as public switch telephone/data networks, and hence many security issues with the wire-line networks also apply to the wireless environment. Risks in wireless networks are equal to the sum of the risk of operating a wired network plus the new risks introduced by weakness in wireless protocols. Thus, wireless mobile communication technology is more vulnerable to security risks than fixed wired technology as monitoring airwaves is a much easier thing to do.

Establishment of protective measures that guarantee a state of the inviolability from antagonistic acts is an important requirement of wireless communication. Therefore, a major concern regarding the safeguard of the subscriber's privacy arises. The constraints of security include issues like, the weakness and limitations of mobile and communications, the architecture limitations, the user requirements, the contents of the provided services, and the evolution of the hacking techniques. The GSM system doesn't provide end-to-end security and lacks in provision of the traffic confidentiality to its subscribers.

Anonymity, authentication, and confidentiality are the security services which are offered by the world's largest mobile telephony system. Still the system is defenceless against many attacks and fails to ensure that safety of the user's telephone conversations and data transfer sessions. In GSM networks, only the radio link between the mobile terminal and the base station is encrypted whereas the rest of the network transmits data in clear-text. Radio link confidentiality in GSM is not sufficient for attaining end-to-end security. As a result, a need for investigating mechanism for implementing absolute confidentiality of traffic arises.

Security model:

Purpose of GSM security:

As we know that security is true essential feature in any series hence, GSM network also follows certain level of security in the series which provides. As we know that GSM users radio communications for its mobile subscribers

that makes it sensitive services for the person who are unauthorized users and are accessing through the different mobile stations. These unauthorized users pretend that they are usual subscribers and listen to private conversations which are being exchanged on the radio paths. Hence, there are mainly two security purposes which are kept in mind when it is concerned of GSM network.

First of all, to protect accessibility to the mobile services and secondly to prevent the disclosure of any crucial information/data at the radio path to achieve the privacy regarding to the particular data.

Security Architecture of the GSM:

The security architecture of GSM was originally intended to provide security services such as anonymity, authentication, and confidentiality of user data and signalling information. The security goals of GSM are as follows:

- Authentication of mobile users for the network,
- Confidentiality of user data and signalling information,
- Anonymity of subscriber's identity,
- Using SIM (Subscriber Identity Module) as a security module.

The Mobile Station (MS) consists of the Mobile Equipment (ME), and the SIM card. The SIM is a cryptographic smart card with the GSM specific applications loaded onto it. As a smart card, it has some inherent security functions specified to smart cards. Its operating system and chip hardware have several security attributes. SIM includes all the necessary information to access the subscriber's account. IMSI and Ki are stored on every SIM. IMSI is the International MobileSubscriber Identity with at most 15 digits uniquely devoted to every mobile subscriber in the world.

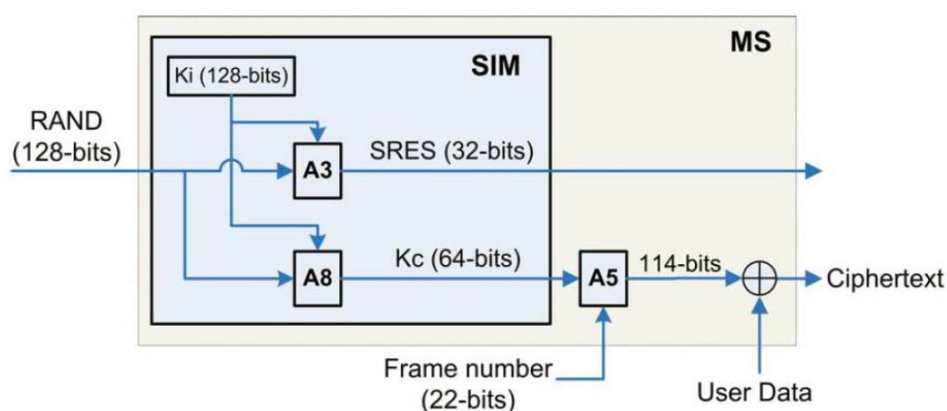


Fig. 1: GSM Authentication, Session key generation and Ciphering

Ki (Individual subscriber authentication Key) is a random 128-bits number that is the root cryptographic key used for generating session keys, and authenticating the mobile users to the network. Ki is strictly protected and is stored on the subscriber's SIM, and AuC. The SIM is itself protected by an optional Personal Identification Number (PIN). Each user is requested to enter the PIN unless this feature is deactivated by the user. After a number of invalid attempts that is usually 3 times, the SIM locks out the PIN, and the PUK (PIN Unlock) is then requested. If the PUK is also incorrectly entered for a number of times that is usually 10 times, the SIM refuses local accesses to its privileged information and authentication functions, and makes it useless.

SIM includes all the necessary information to access the subscriber's account. IMSI and Ki are stored on every SIM. Authentication and confidentiality of user data are in deposit of the secrecy of IMSI and Ki. A3 and A8 algorithms are also implemented on every SIM. A3 is mainly used for authenticating users to the network while A8 is used for generating the session key of encryption Kc. After user authentication, the network can order the phone to start the encryption by using the generated session key Kc.

33. EYE MOVEMENT BASED HUMAN COMPUTER INTERACTION

Eye movement-based interaction is one of several areas of current research in human computer interaction in which a new interface style seems to be emerging. In the non-command style, the computer passively monitors the user and responds as appropriate, rather than waiting for the user to issue specific commands.



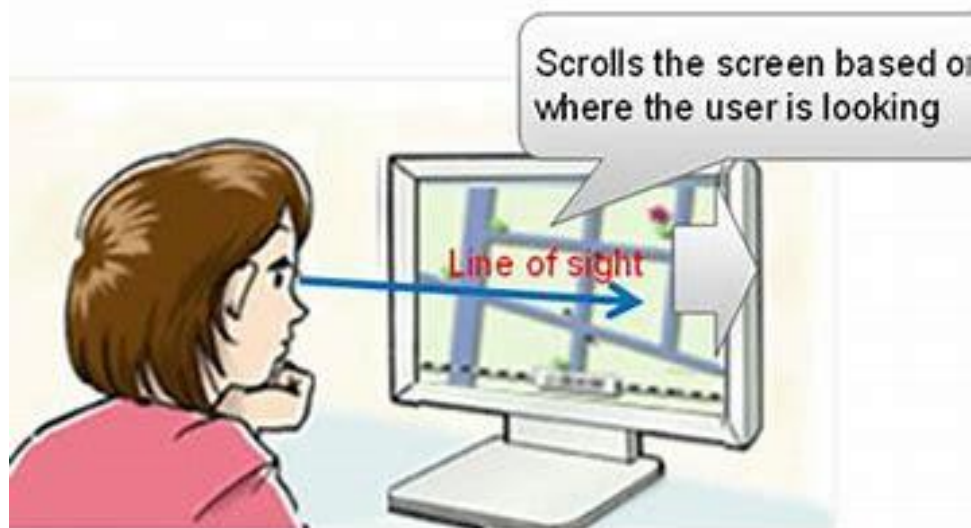
In describing eye movement-based human-computer interaction we can see two distinctions, one is in the nature of the user's eye movements and the other, in the nature of the responses. In the world created by an eye movement-based interface, users could move their eyes to scan the scene, just as they would a real-world scene, unaffected by the presence of eye tracking equipment movement, on the eye movement axis. The alternative is to instruct users of the eye movement-based interface to move their eyes in particular ways. On the response axis, objects could respond to a user's eye movements in a natural way that is, the object responds to the user's looking in the same way real objects do. The alternative is unnatural response, where objects respond in ways not experienced in the real world. Now a days Eye tracking technology is applied in many fields like automotive defence and medical industries. The fields of advertising, entertainment, packaging and web design have all benefited significantly from studying the visual behaviour of the consumer. Every day, as eye tracking is used in creative new ways, the list of applications grows.

Non-common interface styles:

Eye movement-based interaction is one of several areas of current research in human-computer interaction in which a new interface style seems to be emerging. It represents a change in input from objects for the user to actuate by specific commands to passive equipment that simply senses parameters of the user's body. Jakob Nielsen describes this property as non-command-based: The fifth-generation user interface paradigm seems to be centred around non-command-based dialogues.

Perspectives on eye movement-based:

Interaction As with other areas of user interface design, considerable leverage can be obtained by drawing analogies that use people's already-existing skills for operating in the natural environment and searching for ways to apply them to communicating with a computer. Direct manipulation interfaces have enjoyed great success, particularly with novice users, largely because they draw on analogies to existing human skills (pointing, grabbing, moving objects in physical space), rather than trained behaviours; and virtual realities offer the promise of usefully exploiting people's existing physical navigation and manipulation abilities. These notions are more difficult to extend to eye movement-based interaction, since few objects in the real world respond to people's eye movements.



Characteristics of eye movements:

In order to proceed with the design of effective eye movement-based human-computer interaction, we must first examine the characteristics of natural eye movements, with emphasis on those likely to be exhibited by a user in front of a conventional (non-eye tracking) computer console.

Problems in using eye movements:

IN A HUMAN-COMPUTER DIALOGUE The naivest approach to using eye position as an input might be to use it as a direct substitute for a mouse: changes in the user's line of gaze would directly cause the mouse cursor to move. This turns out to be an unworkable (and annoying) design. There are two culprits for why direct substitution of an eye tracker for a mouse is not possible. The first is the eye itself, the jerky way it moves and the fact that it rarely sits still, even when its owner thinks he or she is looking steadily at a single object; the other is the instability of the available eye tracking hardware. There are significant differences between a manual input source like the mouse and eye position; some are advantages and some, disadvantages; they must all be considered in designing eye movement-based interaction techniques.

Visual Feedback to User:

One obvious question is whether the system should provide a screen cursor that follows the user's eye position (as is done for mice and other conventional devices). If the eye tracker - 18 - were perfect, the image of such a cursor would become stationary on the user's retina and thus disappear from perception. In fact, few eye trackers can track small, high-frequency motions rapidly or precisely enough for this to be a problem, but it does illustrate the subtlety of the design issues.

34. BARCODE TECHNOLOGY

What is Barcode?

A barcode is a printed series of parallel bars or lines of varying widths used to input data into a computer system. The bars are usually black on white, and their width and quantity vary depending on the application. The bars are used to represent the binary digits 0 and 1, which can then represent numbers ranging from 0 to 9 and processed by a digital computer.

An optical (laser) scanner integrated into a computer system reads barcode data. A handheld scanner or barcode pen is used to scan the code, or the code is manually moved across a scanner built into a checkout counter or other surface. The data in the barcode is then stored or immediately processed by the computer.

Barcode was first used in the 1970s and has since become an integral part of everyday commercial transactions. Grocery stores use the codes to obtain prices and other information about goods at the point of purchase by the consumer.

A scanner is used to identify a product through its barcode at a typical supermarket checkout counter, and a computer then looks up the item's price and feeds that number into the cash register, where it becomes part of the bill for the customer's purchases.

Types of Barcode Technology:

- MSI PLESSY
- UPC CODE
- EAN CODE
- CODE 39
- CODE 128.



MSI PLESSEY:

MSI Plessey (or Modified Plessey) barcodes are used in retail environments for inventory management, such as labeling supermarket shelves. They're also used in warehouses and other storage facilities to help with inventory accuracy.

UPC CODE:

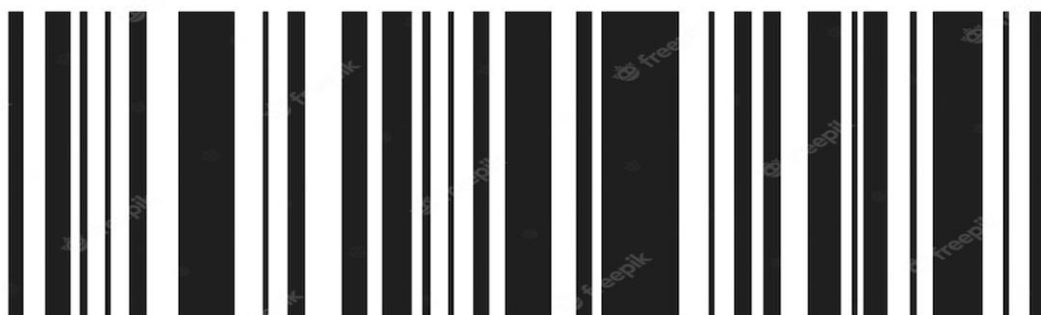
UPC barcodes are used to label and scan consumer goods at points of sale around the world, primarily in the United States, but also in the United Kingdom, Australia, and New Zealand. The UPC-A variant encodes twelve numerical digits, whereas the UPC-E variant encodes only six numerical digits. UPC is an abbreviation for universal product code. The purpose of this barcode in retail is to make it easy for users to identify specific product features (such as size or colour) when an item is scanned at checkout.

CODE 39:

Code39 barcodes (or Code 3 of 9) are widely used to label goods in many industries, including the automotive industry and the United States Department of Defence. It supports both digits and characters, and its name derives from the fact that it could only encode 39 characters—though the character set has been expanded to 43 in its most recent version. It is comparable to, but not as small as, the Code 128 barcode.

CODE 128:

Code 128 barcodes are compact, high-density codes used for ordering and distribution in the logistics and transportation industries. They are intended for non-point-of-sale products, such as when supply chain applications label units with serial shipping container codes (SSCC). Code 128 barcodes can store a wide range of data because they support any character from the ASCII 128-character set.



No : 12345678900000000000

Benefits of Using Barcode Technology:

While barcodes were designed to speed up the sales and transaction process, there are also several other advantages of barcode technology.

- Using a barcode to process a product's data is far more accurate than having a sales associate enter that data manually, which is prone to human error.
- Data about inventory levels or sales is immediately available due to the speed with which the information is processed.
- Training requirements have been reduced. Employees don't need much training to use a barcode scanner because of its simplicity (just point and click).
- Improved Inventory Management Retailers benefit from faster cycle counts and more accurate inventory turnover estimations thanks to improved accuracy and real-time data.
- Implementation Costs are Low. The process of creating barcodes is quick and easy, and retailers can anticipate savings after implementation due to improved transaction speed and inventory and sales data accuracy.

35. MULTI-TOUCH TECHNOLOGY

What is Multi-touch Technology:

Multi-Touch technology works with Trackpads (or Touchpads) and touch-screen interfaces, like those found on laptops, smartphones and tablets. It allows users to interact with their devices in a multitude of ways, by expanding the number of interface options. Rather than simply swipe and tap, Multi-Touch allows for zooming, scrolling, selecting, and more. It is designed to provide touch-screen interfaces with the same sort of flexibility and usability that a traditional mouse and keyboard provide, while also providing for a more intuitive and seamless user experience.

Examples of Multi-Touch:

Examples of Multi-Touch technology in practice include smartphones, tablets, touch tables and walls (like those found in museum exhibits and commercial spaces), and laptops with Trackpads. All of these devices allow for individuals to interact with them in different ways, thanks to Multi-Touch technology. For example, you can zoom in or out by pinching or expanding two fingers across a touch screen or Trackpads. This is the nature of Multi-Touch technology – different hand gestures result in different functions.

Lenovo's ThinkPad Series of laptops features Multi-Touch technology throughout the range for ease of use, more efficient and effective controls, and a more rewarding user experience. With a minimal learning curve required to master the interface, the Trackpads is an incredibly powerful interface device that makes your laptop as potent and useful a machine as a desktop computer.

How does Multi-Touch work?



Multi-Touch technology works with touch-screen and Trackpad interfaces. Both of these surfaces are able to measure and respond to pressure through the use of a pressure-sensitive panel carrying an electrical charge. Where a pressure is applied, the electrical charge is disrupted, which is read by the computer as an input. This input is then translated to a corresponding motion or function by the device's software. Multi-Touch technology allows these panels to read and interpret multiple pressure points, including gestures, at the same time.

Future of Multi-Touch:



As touch-screen interfaces become more commonplace, we can expect more and more uses to be realized from this technology. Already, Multi-Touch technology allows users to swipe, scroll, select, zoom in, zoom out, and move a cursor about. In the future, you may be able to manipulate objects that were once static and 2D in a 3D realm. Alternatively, you may be able to rotate objects, flip them over or manipulate them in other ways, through a simple hand gesture. The hardware is there – all that's left is for the technology to ignite the minds of inventors around the world to create clever new uses.

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36. USAGE OF WEB SERVICES

Web services allow different organisations or applications from multiple services to communicate without the need to share sensitive data or IT infrastructure. Instead, all information is shared through a programmatic interface across a network.

Web Service:

The Internet is the worldwide connectivity of hundreds of thousands of computers of various types that belong to multiple networks. On the World Wide Web, a web service is a standardized method for propagating messages between client and server applications. A web service is a software module that is intended to carry out a specific set of functions. Web services in cloud computing can be found and invoked over the network. The web service would be able to deliver functionality to the client that invoked the web service. A web service is a set of open protocols and standards that allow data to be exchanged between different applications or systems. Web services can be used by software programs written in a variety of programming languages and running on a variety of platforms to exchange data via computer networks such as the Internet in a similar way to inter-process communication on a single computer.

Any software, application, or cloud technology that uses standardized web protocols (HTTP or HTTPS) to connect, interoperate, and exchange data messages – commonly XML (Extensible Markup Language) – across the internet is considered a web service.

Functions of Web Services:

- It's possible to access it via the internet or intranet networks.
- XML messaging protocol that is standardized.
- Operating system or programming language independent.
- Using the XML standard, it is self-describing.
- A simple location approach can be used to locate it.
- Components of Web Service.
- XML and HTTP is the most fundamental web services platform.

The following components are used by all typical web services:

- SOAP (Simple Object Access Protocol)
- UDDI (Universal Description, Discovery, and Integration)
- WSDL (Web Services Description Language)

Characteristics of Web Service:

XML Based: The information representation and record transportation layers of a web service employ XML. There is no need for networking, operating system, or platform binding when using XML.

Loosely Coupled: A customer of an internet service provider isn't necessarily directly linked to that service provider. The user interface for a web service provider can change over time without impacting the user's ability to interact with the service provider. A loosely connected architecture makes software systems more manageable and allows for easier integration between different structures.

Capability to be Synchronous or Asynchronous: Synchronicity refers to the client's connection to the function's execution. The client is blocked and the client has to wait for the service to complete its operation, before continuing in synchronous invocations.

Coarse-Grained: Object-oriented systems, such as Java, make their services available through individual methods. At the corporate level, a character technique is far too fine an operation to be useful. Building a Java application from the ground, necessitates the development of several fine-grained strategies, which are then combined into a rough-grained provider that is consumed by either a buyer or a service.

Supports Remote Procedural Call: Consumers can use an XML-based protocol to call procedures, functions, and methods on remote objects utilizing web services.

Supports Document Exchanges: One of XML's most appealing features is its simple approach to communicating with data and complex entities. These records can be as simple as talking to a current address or as complex as talk into an entire book or a Request for Quotation. Web administrations facilitate the simple exchange of archives, which aids incorporate reconciliation.

Advantages of Web Service:

Business Functions can be exposed over the Internet: A web service is a controlled code component that delivers functionality to client applications or end-users. This capability can be accessed over the HTTP protocol, which means it can be accessed from anywhere on the internet. Because all apps are now accessible via the internet, Web services have become increasingly valuable. Because all apps are now accessible via the internet, Web services have become increasingly valuable. That is to say, the web service can be located anywhere on the internet and provide the required functionality.

Interoperability: Web administrations allow diverse apps to communicate with one another and exchange information and services. Different apps can also make use of web services. A .NET application, for example, can communicate with Java web administrations and vice versa. To make the application stage and innovation self-contained, web administrations are used.

Communication with Low Cost: Because web services employ the SOAP over HTTP protocol, you can use your existing low-cost internet connection to implement them. Web services can be developed using additional dependable transport protocols, such as FTP, in addition to SOAP over HTTP.

A Standard Protocol that Everyone Understands: Web services communicate via a defined industry protocol. In the web services protocol stack, all four layers (Service Transport, XML Messaging, Service Description, and Service Discovery) use well-defined protocols.

Reusability: A single web service can be used simultaneously by several client applications.

37. USAGE OF DATA SCIENCE

Introduction:

Data Science is a combination of multiple disciplines that uses statistics, data analysis, and machine learning to analyse data and to extract knowledge and insights from it.

What is DATA SCIENCE?

Data Science is about data gathering, analysis and decision-making. Data Science is about finding patterns in data, through analysis, and make future predictions.

By using Data Science, companies are able to make:

- Better decisions (should we choose A or B)
- Predictive analysis (what will happen next?)
- Pattern discoveries (find pattern, or maybe hidden information in the data)

Where is DATA SCIENCE Needed?

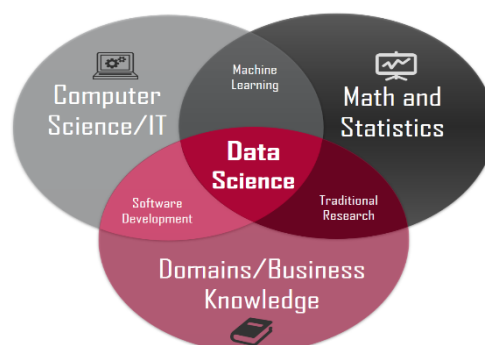
Data Science is used in many industries in the world today.

E.g. banking, consultancy, healthcare, and manufacturing.

How Does a DATA SCIENTIST WORK?

A Data Scientist requires expertise in several backgrounds:

- Machine Learning
- Statistics
- Programming (Python or R)
- Mathematics
- Databases



DATA SCIENCE used in daily life:

All the search engines like Google, Bing, Yahoo, AOL, ask etc leverage data science algorithms to come up with the best results for the searched query within a fraction of a second.

DATA SCIENCE uses:

Data science can add value to any business by using its data to develop solutions and optimize day-to-day operations. Data science can be used for statistics, hiring candidates, and making more informed business decisions based on a data-oriented approach.

Uses of DATA SCIENCE

- Decision-making
- Problem solving
- Understanding
- Improving processes
- Understanding customers.

Future of DATA SCIENCE:

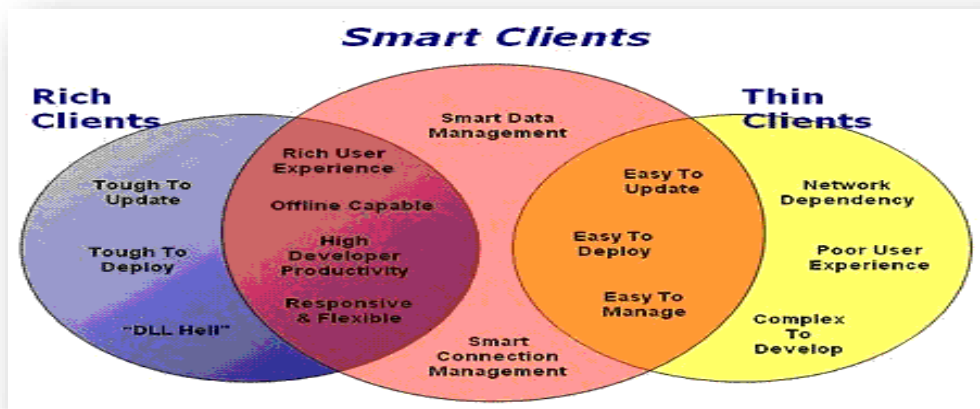
The future of Data Science jobs will look like the middleman who can communicate with computers and humans. AI and Machine learning are just tools that a data scientist uses to deal with big data. Data Science and Machine learning go hand in hand.

Conclusion :

In conclusion, data science is a crucial field in today's data-driven society. It offers useful information that businesses may use to improve decision-making, streamline processes, and maintain competitiveness in a constantly changing market.

38. SMART CLIENT APPLICATION DEVELOPMENT USING .NET

A Smart Client is an application that uses local processing, consumes XML Web Services and can be deployed and updated from a centralized server. While the .NET Framework (Windows Forms) and the .NET Compact Framework provide the ability to develop Smart Clients with ease, other technologies can provide smart client applications by utilizing the same architecture. Smart Client is the concept of architecting your application solution into a smart, flexible and convenient platform that utilizes web services for communication.



Developing smart client applications using .NET involves creating desktop applications that offer rich user experiences and can leverage the capabilities of the client machine. Here's an overview of the process:

Choose the right framework: Decide on the framework to use. Windows Forms and Windows Presentation Foundation (WPF) are popular choices for building smart client applications with .NET.

IDE selection: Use Microsoft Visual Studio, the primary IDE for .NET development, to create your application. It provides tools, templates, and a drag-and-drop designer to streamline the development process.

Design UI: Design the user interface (UI) using the designer tools available in Visual Studio. Windows Forms provides a more traditional UI, while WPF offers more modern and flexible UI design capabilities.

Code logic: Write the application logic using C# or VB.NET, the main programming languages for .NET development. Implement functionality, handle events, and manage user interactions.

Data access: Integrate data access components to interact with databases or web services. .NET offers libraries like ADO.NET for database access.

Security: Implement security measures such as authentication and authorization. Utilize .NET's security features to protect your application and user data.

Integration: Integrate with other services, APIs, or external systems. .NET supports various integration options like REST APIs, SOAP, and more.

Deployment: Prepare your application for deployment. You can create installers using tools like Click Once for easy distribution. Ensure that the client machine has the required .NET runtime installed.

Testing: Thoroughly test your application to identify and fix any bugs or issues. Automated testing frameworks like MS Test or NUnit can be used.

Performance optimization: Optimize the application's performance by profiling and identifying bottlenecks. Utilize .NET's performance analysis tools to improve speed and responsiveness.

Maintenance and updates: Plan for ongoing maintenance, bug fixes, and updates to keep your application current and functional.

Offline capabilities: Consider incorporating offline functionality, allowing users to work without a constant internet connection. This is particularly important for smart client applications.

User experience: Focus on delivering a seamless and user-friendly experience. Leverage .NET's UI capabilities to create visually appealing and intuitive interfaces.

Cross-platform considerations: If needed, explore cross-platform capabilities using technologies like Xamarin or .NET MAUI to extend your application to other platforms.

39. ROLE OF AI IN COMPUTER VISION

Computer vision is a field of AI that trains computers to capture and interpret information from image and video data. By applying machine learning (ML) models to images, computers can classify objects and respond—like unlocking your smartphone when it recognizes your face. From enhancing your selfies with a fun fox filter to detecting lung lesions in medical images, computer vision has more applications than a college administrator’s inbox.



AI plays a significant role in computer vision by enabling machines to interpret and understand visual information. It's used in various applications such as:

Object recognition: AI algorithms can identify and classify objects within images or videos, which has applications in fields like autonomous vehicles, surveillance, and quality control.

Image captioning: AI generates descriptive captions for images, enhancing accessibility and aiding content understanding.

Facial recognition: AI-powered facial recognition systems can identify individuals, contributing to security, user authentication, and personalization.

Medical imaging: AI assists in diagnosing diseases by analysing medical images, such as X-rays and MRIs, for anomalies and patterns.

Autonomous systems: AI helps robots and drones navigate and interact with their environments by processing visual input.

Augmented reality (AR) and virtual reality (VR): AI enhances AR and VR experiences by enabling real-time object recognition and interaction.

Gesture recognition: AI can interpret human gestures for controlling devices or interacting with digital interfaces.

Video analysis: AI algorithms analyse video content for activity detection, content moderation, and insights.

Industrial automation: AI-powered computer vision systems monitor manufacturing processes, detect defects, and ensure quality control.

Agriculture: AI-based systems can identify crop diseases, assess crop health, and optimize planting and harvesting.

Retail: Computer vision helps retailers with inventory management, customer tracking, and enhancing the shopping experience.

Security and surveillance: AI analyses video feeds to identify suspicious activities or objects, improving security measures.

Entertainment: AI enhances visual effects in movies and games, creating more realistic and immersive experiences.

Accessibility: AI assists visually impaired individuals by describing visual content in real time.

Environmental monitoring: AI-powered cameras and sensors monitor ecosystems, track wildlife, and assess environmental changes.

AI's role in computer vision continues to evolve, with ongoing advancements in deep learning, neural networks, and data processing techniques. It enables machines to interpret the visual world more accurately, making it a crucial technology in various industries.

Computer vision depends on scale-out, file-based storage. We're talking about billions of files. Lucky for you, NetApp is positioned as a leader in the IDC Markets cape for worldwide scale-out, file-based storage.

40. INTRODUCTION TO CRYPTO CURRENCY

Crypto currency:

Cryptocurrency is a digital currency used as an alternative payment method or as an investment. Cryptocurrencies get their name from the cryptographic techniques that enable people to buy, sell or trade them securely without the need for a controlling authority, such as a government or financial institutions.

Payment crypto currency:

The first major type of cryptocurrency is payment cryptocurrency. Bitcoin, perhaps the most famous cryptocurrency, was the first successful example of a digital payment cryptocurrency. The purpose of a payment cryptocurrency, as the name implies, is not only as a medium of exchange but also as a purely peer-to-peer electronic cash to facilitate transactions.

Broadly speaking, since this type of cryptocurrency is meant to be a general-purpose currency, it has a dedicated blockchain that only supports that purpose. It means that smart contracts and decentralized applications cannot be run on these blockchains.

Types of Crypto currencies:

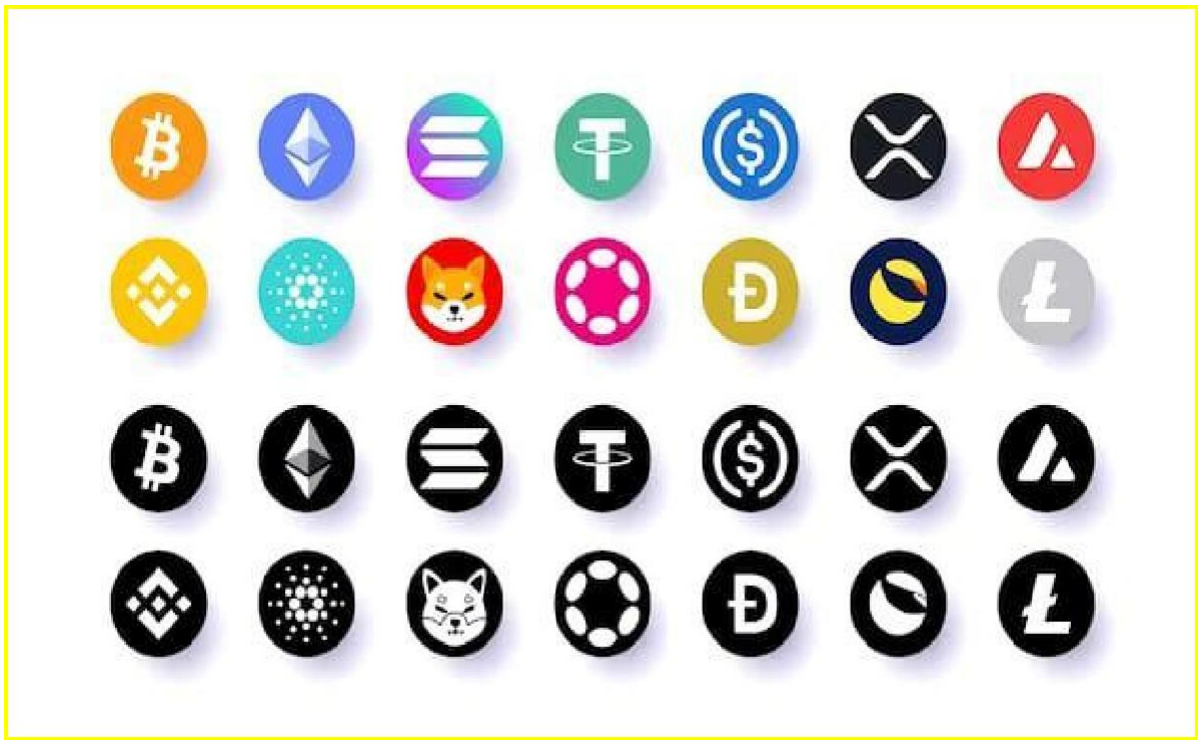
The first type of crypto currency was Bitcoin, which to this day remains the most-used, valuable and popular. Along with Bitcoin, other alternative cryptocurrencies with varying degrees of functions and specifications have been created. Some are iterations of bitcoin while others have been created from the ground up

Bitcoin was launched in 2009 by an individual or group known by the pseudonym “Satoshi Nakamoto. As of March 2021, there were over 18.6 million bitcoins in circulation with a total market cap of around \$927 billion.

The competing cryptocurrencies that were created as a result of Bitcoin’s success are known as altcoins. Some of the well-known altcoins are as follows:


- Litecoin
- Peercoin
- Name coin

- Ethereum
- Cardana



Conclusion:

As crypto matures, we will achieve a lot of stability which will make it easily transferable, and a store of value that will make it more used by businesses, the government, and everyone as a part of everyday life. Crypto currency is still a lot in its early stages and some people are still sceptical about it but it is here to stay and has been adapted into our lives and will be a currency used by everyone which is only a matter of time. With the acceptance and how widely talked about it is, the future of crypto is sure to be bright



Gratitude to the dedicated students whose passion and hard work have breathed life into our department's magazine. Your creativity and commitment have transformed ideas into vibrant pages, making this publication a testament to the incredible talent within our college community. Thank you for your invaluable contributions!"