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ARTIFICIAL INTELLIGENCE

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Introduction:-

Artificial intelligence (AI) is wide-ranging branch of computer science concerned with building smart machines capable of performing tasks that typically require human intelligence.

The term may also be applied to any machine that exhibits traits associated with a human mind such as learning and problem-solving.

The ideal characteristic of artificial intelligence is its ability to rationalize and take actions that have the best chance of achieving a specific goal.

Applications of Artificial Intelligence:-

- AI is being tested and used in the healthcare industry for dosing drugs and different treatment in patients, and for surgical procedures in the operating room.
- Artificial intelligence include computers that play chess and self-driving cars.
- For self-driving cars, the computer system must account for all external data and compute it to act in a way that prevents a collision.
- Artificial intelligence in the financial industry is used to detect and flag activity in banking and finance such as unusual debit card usage and large account deposits.
- Applications for AI are also being used to help streamline and make trading easier. This is done by making supply, demand, and pricing of securities easier to estimate.

Categories of Artificial Intelligence:-

Artificial intelligence can be divided into two different categories:

- Weak artificial intelligence
- Strong artificial intelligence

Weak artificial intelligence embodies a system designed to carry out one particular job. Weak AI systems include video games such as the chess, personal assistants such as Amazon's Alexa.

Strong artificial intelligence systems are systems that carry on the tasks considered to be human-like. These tend to be more complex and complicated systems. These kinds of systems can be found in the applications like self-driving cars or in hospital operating rooms.

Benefits of Artificial Intelligence:-

- **Increase work efficiency-** Artificial intelligence powered machines are great at doing a particular repetitive task with amazing efficiency. The simple reason is that

they remove human errors from their tasks to achieve accurate results every time they do that specific task.

- **Work with high accuracy**-Scientists are working to teach artificial intelligence powered machines to solve complex equations and perform critical tasks on their own so that the results obtained have higher accuracy as compared to their human counterparts.

- **Reduce cost of training and operation**-Artificial intelligence uses machine learning algorithms like Deep Learning and neural networks to learn new things like humans do. This way they eliminate the need to write new code every time we need them to learn new things.

Risks of Artificial Intelligence:-

- **Artificial intelligence is unsustainable**-These computer chips have rare earth materials like Selenium as a major constituent. Besides, the batteries of such machines run on Lithium, again a rare element in earth's crust. The increased mining of these materials is irreversibly damaging our environment at a rapid pace

- **Lesser Jobs**-There is no doubt that machines do routine and repeatable tasks much better than humans. Many businesses would prefer machines instead of humans to increase their profitability, thus reducing the jobs that are available for the human workforce.

Conclusion:-

Every coin has two sides and Artificial intelligence is no different. The rise of Artificial intelligence powered machines has undoubtedly eased our lives in many applications even today. But there is a need to strongly emphasize on creating ethical codes and policies to ensure that the risks associated with Artificial intelligence are mitigated to the minimum.

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INTERNET OF THINGS (IOT)

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Introduction

IoT is one of the most emerging trends in computer technology. It is simply a network of internet connected objects to collect and exchange data. The Internet of Things (IoT) carries enormous potential to change the world for better.

Technologies of IoT

Access to low-cost, low-power sensor technology: Affordable and reliable sensors are making IoT technology possible for more manufacturers.

Connectivity: A host of network protocols for the internet has made it easy to connect sensors to the cloud and to other "things" for efficient data transfer.

Cloud computing platforms: The increase in the availability of cloud platforms enables both businesses and consumers to access the infrastructure they need to scale up without actually having to manage it all.

Machine learning and analytics: With advances in machine learning and analytics, along with access to varied and vast amounts of data stored in the cloud, businesses can gather insights faster and more easily. The emergence of these allied technologies continues to push the boundaries of IoT and the data produced by IoT also feeds these technologies.

Conversational artificial intelligence (AI): Advances in neural networks have brought natural-language processing (NLP) to IoT devices (such as digital personal assistants Alexa, Cortana, and Siri) and made them appealing, affordable, and viable for home use.

IoT Security

IoT security includes both physical device security and network security, encompassing the processes, technologies, and measures necessary to protect IoT devices as well as the networks they're connected to. It spans industrial machines, smart energy grids, building automation systems, employees' personal IoT devices, and more, including devices that often aren't designed for network security. IoT device security must protect systems, networks, and data from a broad spectrum of IoT security attacks, which target four types of vulnerabilities:

- Communication attacks, which put the data transmitted between IoT devices and servers at risk.
- Lifecycle attacks, which put the integrity of the IoT device as it changes hands from user to maintenance.
- Attacks on the device software.
- Physical attacks, which target the chip in the device directly.

Prevention Measures

1. Insecure Web interface
2. Insufficient authentication or authorization
3. Insecure network services
4. Lack of transport encryption
5. Privacy concerns
6. Insecure cloud interface
7. Insecure mobile interface
8. Insufficient security configuration
9. Insecure software or firmware
10. Poor physical security

Conclusion

Therefore, to ensure service continuity in the IoT, it is important to secure the hardware layer in which data are harvested and transmitted. In this journal, the hardware-level security in IoT and preventive measures to protect the systems are discussed.

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3D PRINTING

SHILPA.K (18MCA17)

INTRODUCTION:

3D printing can also be referred to as Additive Manufacturing. Additive manufacturing is a process of joining materials to make objects methodologies. As a new tool in the entrepreneurial toolbox, additive manufacturing system use computer aided design model and 3D scanning systems for production.3D printing is a process by which 3D objects of any shape or geometry can be created by digital file. The creation is archived by laying down successive layers of a specific material until the entire object is created. Each of these layers represents a thinly sliced horizontal cross section of the eventual object, in contrast to traditional subtractive manufacturing methods which relies upon the removal of material to create something.

THE HISTORY OF 3D PRINTING:

3D printing is a new technology, the birth of 3D printing was in 1984 at the hands of chuck hull who invented a process known as stereo lithography which layers are added by curing photopolymers with UV lasers, after that 1990 layer technology used each layer has 0.1 mm depth in 1999 the first use in medicine in 2000the first path of human such as ears, fingers was done 2005.3D printing technology became open source.in 2006 the first SLS machine became variable,2009 atom printing were done which allows Bio3D printing, in 2001 the first 3D printer Robotic Aircraft at the same year the world first 3D printing car available.

COMPONENT OF 3D PRINTER:

A 3D printer includes a set of components that operate simultaneously to produce the desire output from the input digital file, the basic components of a 3D printer are listed below:

- Print Bed (Tray)
- Extruder
- Hot-end
- Filament

BASIC PRINCIPLE OF 3D PRINTING:

1. Selective laser sintering: In this technology powdered material is used instead of liquid resin. Nylon, ceramics, glass, aluminum, steel or silver.
2. Selective laser melting: in this process the powder material used in the printer is melted instead of combining them.
3. Electronic beam melting: 3D printing uses the electron beam instead of UV rays.

ADVANTAGES:

- Quicker and proximity to market.
- Cost saving efficient and economical.
- Increased data security.

- More rigorous product testing.
- Early changes saves money.

DISADVANTAGES:

- Limitation in speed.
- Materials.
- Real world proofing.
- Post processing.

CONCLUSION:

It is generally accepted that 3D printing will be a revolutionary force in manufacturing, whether positive or negative. Despite concerns over counterfeiting, many companies are already using that technology repeatedly produce intricate components for example in automotive and aerospace manufacturing.

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AUTONOMOUS THINGS

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Autonomous Things (AuT), also known as the Internet of Autonomous Things (IoAT), are devices that use machine learning and artificial intelligence (AI) algorithms to complete specific tasks. AuTs are equipped with sensors, AI and analytical capabilities to improve the things they can do. To that effect, each machine can make its own decision and complete tasks autonomously.

Some examples of AuT are self-driving cars, drones, autonomous smart home devices, and every other technology that does not need human control to be operational. These technologies may aid in the partial or full completion of tasks. Hence, AuT has found use cases in several industries including retail, security, transportation, security, and military.

Popular Trends in Autonomous Things

Autonomous Vehicles: Autonomous vehicles are still in their development stage, nonetheless, the mere fact that cars will someday drive on their own has caught the attention of many. These vehicles will eliminate human error, which is the major cause of road accidents.

Autonomous Drones: Drones are often controlled by an operator, but that is changing rapidly. Drones can now control themselves and make decisions based on the situation. In addition, modern drones are being used as delivery vehicles, especially by the military.

Robotics: Robotics encompasses personal robots, delivery robots, smart robots, autonomous mobile robots, and robotic appliances. There's the delivery robot, for example, which is currently used in warehouses for the manufacturing process.

Current Use Cases of Autonomous Things

Robo-taxis: It is a ride-hailing platform from Tesla, an American electric vehicle and clean energy company.

Vehicle Platooning: Platooning or flocking offers seamless communication between a group of self-driving trucks. The distance between each vehicle is reduced, thereby enabling them to accelerate and brake at the same time.

Shopping Systems: There are autonomous shopping systems like the Amazon Go, which enables shoppers to make purchases without relying on checkout or cashiers.

Military Drones: Military drones have advanced greatly from what they were before. Today, autonomous drones collect intelligence and support decision making in real-time.

Lethal autonomous weapons (LAWs): LAWs are still being researched and there seems to be a disagreement among reputable members of the public about the use of autonomous weapons in the military.

Search and Rescue: The Netherlands' Delft University of Technology is meddling with ambulance drone technology. A drone of this nature will improve emergency infrastructure, thereby increasing the number of people rescued each time.

Weather Forecasting: More accurate weather forecasts can change the way businesses operate and how people lead their lives.

Challenges of Autonomous Things

1. Environmental Conditions
2. Cybersecurity
3. Regulations
4. Accident Liability
5. Costs

Leading Companies Using Autonomous Things

1. Argo AI
2. Aptiv
3. Baidu
4. BMW
5. Derq
6. Ford
7. GM Cruise
8. Tesla
9. Volvo
10. Waymo

Drones

1. 3DR
2. Airdata UAV
3. Airmap
4. DJI Innovations

5. Juniper Unmanned

6. Percepto

7. Skycatch

8. SolSpec

Conclusion:

Autonomous Things have a high potential to reduce accidents, improve emergency response times, and offer accurate targeting of enemies in war zones. However, these technologies are still new and need to be improved before they become practical to be used in our everyday lives. And most importantly, these devices require different levels of safety to overcome the negative impacts that may stem from their use.

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AMAZON WEB SERVICES (AWS)

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INTRODUCTION

The exponential growth in cloud computing over the past few years has led to a situation that is common to many innovations and new technologies.

Is a secure cloud service platform, offering compute power, database storage, content delivery and other functionality to help businesses scale and grow?

This has forced the realization that new ideas and methods may produce better results than the tried and tested formulas of yesteryear. It is the growing acceptance of innovative technologies that has seen cloud computing become the biggest exhortation in IT.

SERVICES PROVIDED BY AWS:

1) Amazon RDS 2) Amazon auto scaling 3) Amazon SNS 4) Amazon EC2

5) Amazon elastic beanstalk 6) Amazon S3

Internet in flowcharts and diagrams. Another meaning of cloud in cloud computing provides the means through which everything — from computing power to computing infrastructure, applications, business processes to personal collaboration — can be delivered to One meaning of cloud computing is taken from the cloud symbol used to represent you as a service whenever you need. Cloud resources to create their private cloud, the result is called a virtual private cloud. Private or public, the goal of cloud computing is to provide easy, scalable access to computing resources and IT services.

Cloud Computing Cloud computing means the delivery of hosted services over the Internet, and the services are: -

Infrastructure-as-a-Service (IaaS)

Platform-as-a-Service (PaaS)

Software-as-a-Service (SaaS)

> **Infrastructure-as-a-Service** like Amazon Web Services provides virtual server instances with unique IP addresses and blocks of storage on demand. Customers use the provider's application program interface API to start, stop, and access and configure their virtual servers and storage. In the enterprise, cloud computing allows a company to pay for only as much capacity as is needed, and bring more online as soon as required. Because this pay-for-what-you-use model resembles the way electricity, fuel and water are consumed; it's sometimes referred to as utility computing.

> **Platform-as-a-service** in the cloud is defined as a set of software and product development tools hosted on the provider's infrastructure. Developers create applications on the provider's platform over the Internet. PaaS providers may use APIs, website portals or gateway software

installed on the customer's computer. Force.com, (an outgrowth of Salesforce.com) and Google Apps are examples of PaaS. Developers need to know that currently, there are not standards for interoperability or data portability in the cloud. Some providers will not allow software created by their customers to be moved off the provider's platform.

> **Software-as-a-service** cloud model, the vendor supplies the hardware infrastructure, the software product and interacts with the user through a front-end portal. SaaS is a very broad market. Services can be anything from Web-based email to inventory control and database processing. Because the service provider hosts both the application and the data, the end user is free to use the service from anywhere.

AMAZON SERVICE

Cloud Formation - If user wants to instantiate with a single click by defining a service configurations and template of the machine, user can include this type of templates form Amazon services like VPC, EC2, Elastic Beanstalk, and others. Clicking few, services can replicate a complicated application and IT infrastructure.

Dynamo DB– For the past several years, referred to as NOSQL systems to the fact they not use SQL as their principal query language, a new class of database system had emerged. These very large data sets are very popular that have the ability to scale horizontally without any manual intervention.

Elastic Compute Cloud (EC2) - Amazon EC2 is the service for building of backbone of multiple virtual servers of the virtual network.

CONCLUSION:

"AWS is a collection of remote computing services (also called web services) that together make up an internet cloud computing platform, offered over the Internet by Amazon.com web site". The well-known and most used of these services are Amazon S3 and Amazon EC2. The service is advertised as providing a large computing capacity (potentially many servers) cheaper and much faster than building a physical server farm.

MICROSOFT AZURE

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INTRODUCTION

Azure is Microsoft's cloud platform, just like Google has it's Google Cloud and Amazon has its Amazon Web Service or AWS.000. Generally, it is a platform through which we can use Microsoft's resource. For example, to set up a huge server, we will require huge investment, effort, physical space and so on. In such situations, Microsoft Azure comes to our rescue. It will provide us with virtual machines, fast processing of data, analytical and monitoring tools and so on to make our work simpler. The pricing of Azure is also simpler and cost-effective. Popularly termed as "Pay As You Go", which means how much you use, pay only for that.

HISTORY

Microsoft unveiled Windows Azure in early October 2008 but it went to live after February 2010. Later in 2014, Microsoft changed its name from Windows Azure to Microsoft Azure. Azure provided a service platform for .NET services, SQL Services, and many Live Services. Many people were still very skeptical about "the cloud". As an industry, we were entering a brave new world with many possibilities. Microsoft Azure is getting bigger and better in coming days. More tools and more functionalities are getting added. It has two releases as of now. Its famous version Microsoft Azure v1 and later Microsoft Azure v2. Microsoft Azure v1 was more like JSON script driven then the new version v2, which has interactive UI for simplification and easy learning. Microsoft Azure v2 is still in the preview version.

It provides three options – infrastructure as a service (IaaS), platform as a service (PaaS) and software as a service (SaaS).

Infrastructure as a service (IaaS)

IaaS is a kind cloud computing where a company provides a part of the computer's resources through virtualization. The user can rent a part of the computer (server) and use it as own. The machine won't show the complete resources it has, but it will show only the shared with this user resources. Different users can use the same server separately. The advantage is that users can use a high-end server without purchasing it. Also, it is very easy to upgrade if the user needs more resources.

Platform as a service (PaaS)

PaaS is an environment in which developers can create different applications. It supports many program languages, and it provides the hardware so users can develop and test applications. The advantage is that it is a complete environment, which lets developers jump into the action by giving them all that they need, including testing tools. It is secure too.

Software as a service (SaaS)

There are plenty of well-known applications that you are using daily like Dropbox, OneDrive and more that deliver services over the internet. Users can access them through an application

or the web browsers, thanks to APIs.Advantage, the multi-platform approach where users can access their data on different devices.

MICROSOFT AZURE SERVICES

Some following are the services of Microsoft Azure offers:

1. Compute: Includes Virtual Machines, Virtual Machine Scale Sets, Functions for serverless computing, Batch for containerized batch workloads, Service Fabric for microservices and container orchestration, and Cloud Services for building cloud-based apps and APIs.

2. Networking: With Azure you can use variety of networking tools, like the Virtual Network, which can connect to on premise data centers; Load Balancer; Application Gateway; VPN Gateway; Azure DNS for domain hosting, Content Delivery Network, Traffic Manager, ExpressRoute dedicated private network fiber connections; and Network Watcher monitoring and diagnostics.

3. Storage: Includes Blob, Queue, File and Disk Storage, as well as a Data Lake Store, Backup and Site Recovery, among others.

4. Web + Mobile: Creating Web + Mobile applications is very easy as it includes several services for building and deploying applications.

5. Containers: Azure has a property which includes Container Service, which supports Kubernetes, DC/OS or Docker Swarm, and Container Registry, as well as tools for microservices.

6. Databases: Azure has also includes several SQL-based databases and related tools.

7. Data + Analytics: Azure has some big data tools like HDInsight for Hadoop Spark, R Server, HBase and Storm clusters

8. AI + Cognitive Services: With Azure developing applications with artificial intelligence capabilities, like the Computer Vision API, Face API, Bing Web Search, Video Indexer, Language Understanding Intelligent.

9. Internet of Things: Includes IoT Hub and IoT Edge services that can be combined with a variety of machine learning, analytics, and communications services.

10. Security + Identity: Includes Security Center, Azure Active Directory, Key Vault and Multi-Factor Authentication Services.

11. Developer Tools: Includes cloud development services like Visual Studio Team Services, Azure DevTest Labs, HockeyApp mobile app deployment and monitoring, Xamarin cross-platform mobile development and more.

CONCLUSION

Microsoft Azure provides a huge versatility. You can use it in many different ways. It is relatively easy to set up (depending on the complexity of the task you need), and it is easy to scale. Azure doesn't require a purchase of hardware, but it uses a subscription model that might be expensive for some. It also has some disadvantages. It is an ecosystem that has many services so it can take a long time before you train your IT staff. Also choosing this platform, you might have a hard time in the future if you decide to migrate to another similar service like Amazon Web Services (AWS) or Google Cloud Platform. You really need to know for what do you need Azure. It is big, and it might be expensive. Take your time thinking about your need first, before you take a decision.

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BIOMETRICS

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Biometrics is the means of identifying and authenticating individuals in a reliable and fast way. It rely on specific data about unique biological traits in order to work effectively. It involves running data through algorithms for a particular result, usually related to a positive identification of a user or other individual.

ADVANTAGES:

1. It is useful for ID verification in a range of government organizations, banks and financial institutions.
2. It is capable of identifying people swiftly, consistently and reliably.
3. It has high individual identification accuracy.
4. They provide a superior level of security than usual means of authentication.
5. It is less exposed to damage and sudden changes.
6. It is very less time consuming, dependable and user friendly.

APPLICATIONS:

1. Law enforcement and public security.
2. Military
3. Border, travel and migration control.
4. Civil identification.
5. Healthcare and subsidies.
6. Commercial applications.

BIOMETRIC TECHNOLOGIES:

- Vein Scan: It can automatically identify a person from the pattern of the blood vessels in the back of the hand. This technology uses near-infrared light to detect vein vessel patterns.
- Facial Thermography: It detects the heat patterns created by the branching of blood vessels and emitted from the skin. It works much like facial recognition, except that an infrared camera is used to capture the image.
- DNA Matching: This uses physiological characteristic for personal identification. It can produce proof positive identification of a person, except in the case of identical twins. It compares actual samples rather than the templates generated from the samples.
- Blood Pulse: Measures the blood pulse on a finger with infrared sensors. This has a high false match rate making it impractical for personal identification. A light sensor illuminates a small patch of skin with a beam of visible and near-infrared light. The light is measured with a spectroscope after being scattered by the skin. The measurements are analyzed, and a distinct optical pattern can be extracted.
- Nailbed identification: This is based on distinct longitudinal, tongue-in-groove spatial arrangement of the epidermal structure directly beneath the fingernail.

When an interferometer is used to detect phase changes in back-scattered light shone on the fingernail, the distinct dimensions of the nailbed can be reconstructed and a one-dimensional map can be generated.

- Gait recognition: Here individuals are recognized by their distinctive walk, captures a sequence of images to derive and analyze motion characteristics. A person's gait can be hard to disguise because a person's musculature essentially limits the variation of motion, and measuring it requires no contact with the person.
- Ear Shape: This recognition is still a research topic. It is based on distinctive shape of each person's ears and the structure of the largely cartilaginous, projecting portion of the outer ear.

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BLOCKCHAIN - Innovation beyond Bitcoin and Banking

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INTRODUCTION

Blockchain technology enables distributed public ledgers that hold immutable data in a secure and encrypted way and ensure that transactions can never be altered. While Bitcoin and other cryptocurrencies are the most popular examples of blockchain usage, this "distributed ledger technology" (DLT) is finding a broad range of uses. Data storage, financial transactions, real estate, asset management and many more uses are being explored.

After the invention of bitcoin in 2008, the blockchain technology that underlies it has been shown to have a variety of applications within financial services and in digital applications beyond. While internet-based currencies are feasible and sustainable, the experience of bitcoin shows that regulatory requirements are still needed. However, before regulators and other stakeholders adapt their practices, they await the outcome of what amounts to a high stake, broad innovation race.

It focuses on innovation around applications of the core protocol and on how building a private and secure version of the blockchain can operate safe and secure networks.

FEATURES

The innovation race is characterized by four features: high levels of investment, a standards race, an effort to control the directions of diffusion, and new rules of the game that will be applicable to generating business models.

1) Whereas R&D spending during the first few years was low, investments by governments, mainstream financial services firms, other large companies as well as numerous starts-ups and small firms has boomed since 2014.

2) While most efforts are presented as technical improvements or application modifications, another agenda is in setting standards and determining which kinds of applications are likely to be most lucrative.

3) This is high stakes experimentation but the winners hope to achieve platforms upon which a range of practices will be built. This explains the diversity of activities but also threatens to create a fragmentation of efforts that will in the first instance confound regulators and might threaten the longer-term viability of the core protocol.

4) Blockchain innovation beyond bitcoin is organizational and related to processes and business models. A new set of rules of the game are being devised and since bitcoin and its associated organizations such as Mt. Gox failed to seize the leadership, the challenge innovators face is to see who will set the pace as Apple did with the iPhone.

CONCLUSION

The potential for this manner of working with blockchains is great. Examples include:

- Nasdaq, uses blockchains for setting and clearing trades in pre-IPO trading;
- Visa is developing a “secure, scalable blockchain network” at a time when the payments industry is undergoing major transformation;
- IBM have connected blockchain to IoT and ran a “proof of concept” on their platform, Adept;
- In healthcare blockchain is regarded as a means to put patients in control of information while delivering a high level of trust.
- Similar applications are possible to voting and consultation systems within democratic organizations;
- Factom has reportedly partnered with the Honduras government on a program to record land ownership.
- Their goal is to reduce fraud and corruption associated with a government-controlled centralized registry.

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CRYPTOCURRENCY

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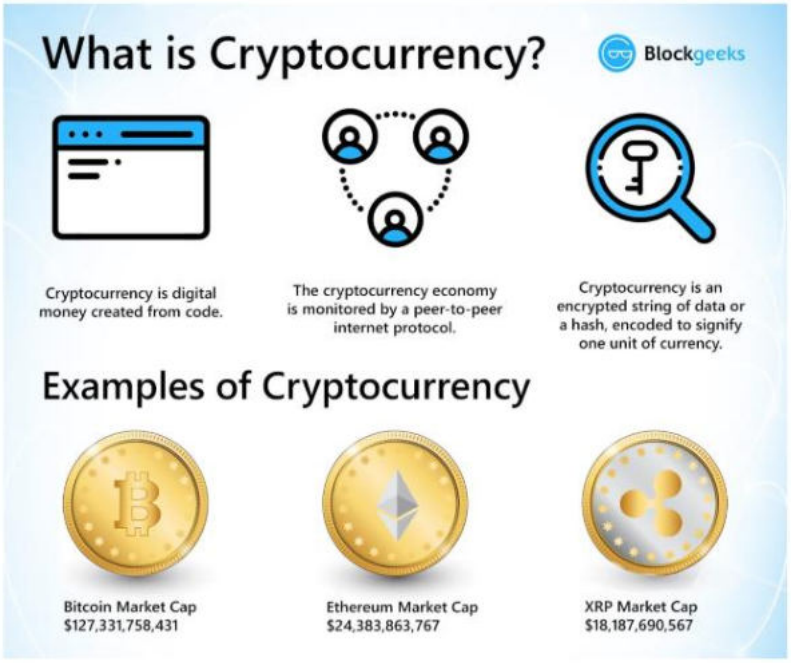
INTRODUCTION

A **cryptocurrency** (or **crypto currency)** is a medium of exchange, such as the US dollar, but is digital and uses encryption techniques to control the creation of monetary units and to verify the transfer of funds. It has no physical form and exist only in the network. It has no intrinsic value.



Cryptocurrencies work using a technology called blockchain. Blockchain is a decentralized technology spread across many computers that manages and records transactions. Part of the appeal of this technology is its security.

HOW IT ALL STARTED?

After seeing all the centralized attempts fail, Satoshi Nakamoto, the unknown inventor of Bitcoin, tried to build a digital cash system without a central entity. Like a Peer-to-Peer network for file sharing. This decision became the birth of cryptocurrency.

WHY ARE THEY SO POPULAR?

- Supporters see cryptocurrencies such as bitcoin as the currency of the future and are racing to buy them now, presumably before they become more valuable

- Some supporters like the fact that cryptocurrency removes central banks from managing the money supply, since over time these banks tend to reduce the value of money via inflation
- Other supporters like the technology behind cryptocurrencies, the blockchain, because it's a decentralized processing and recording system and can be more secure than traditional payment systems
- Some speculators like cryptocurrencies because they're going up in value and have no interest in the currencies' long-term acceptance as a way to move money

HOW MANY ARE OUT THERE, AND WHAT ARE THEY WORTH?

More than 2,200 different cryptocurrencies are traded publicly, according to CoinMarketCap.com, a market research website. And cryptocurrencies continue to proliferate, raising money through initial coin offerings, or ICOs. The total value of all cryptocurrencies on June 6, 2019 was about $246 billion, according to CoinMarketCap, and the total value of all bitcoins, the most popular digital currency, was pegged at about $136 billion.

UNDERSTANDING CRYPTOCURRENCY PROPERTIES

1) Irreversible: After confirmation, a transaction can‘t be reversed. By nobody. And nobody means nobody. Not you, not your bank, not the president of the United States, not Satoshi, not your miner. Nobody. If you send money, you send it. Period. No one can help you, if you sent your funds to a scammer or if a hacker stole them from your computer. There is no safety net.

2) Pseudonymous: Neither transactions nor accounts are connected to real-world identities. You receive Bitcoins on so-called addresses, which are randomly seeming chains of around 30 characters. While it is usually possible to analyze the transaction flow, it is not necessarily possible to connect the real-world identity of users with those addresses.

3) Fast and global: Transactions are propagated nearly instantly in the network and are confirmed in a couple of minutes. Since they happen in a global network of computers they are completely indifferent of your physical location. It doesn‘t matter if I send Bitcoin to my neighbour or to someone on the other side of the world.

4) Secure: Cryptocurrency funds are locked in a public key cryptography system. Only the owner of the private key can send cryptocurrency. Strong cryptography and the magic of big numbers make it impossible to break this scheme. A Bitcoin address is more secure than Fort Knox.

5) Permissionless: You don‘t have to ask anybody to use cryptocurrency. It‘s just a software that everybody can download for free. After you installed it, you can receive and send Bitcoins or other cryptocurrencies. No one can prevent you. There is no gatekeeper.

CONCLUSION

The revolution is already happening. Institutional investors start to buy cryptocurrencies. Banks and governments realize that this invention has the potential to draw their control away. Cryptocurrencies change the world. Step by step. You can either stand beside or observe – or you can become part of history in the making.

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CYBER SECURITY

AKILANDESWARI.T (18MCA02)

INTRODUCTION:

Cyber security is the practice of defending computers, servers, mobile devices, electronic systems, networks, and data from malicious attacks. It's also known as information technology security or electronic information security. These cyberattacks are usually aimed at accessing, changing, or destroying sensitive information; extorting money from users; or interrupting normal business processes. Implementing effective cybersecurity measures is particularly challenging today because there are more devices than people, and attackers are becoming more innovative.

TYPES OF CYBER SECURITY:

In order to be better protected, it's important to know the different types of cybersecurity. These include critical infrastructure security, network security, application security, information security, cloud security, data loss prevention, and end-user education.

Critical infrastructure security: Consists of cyber-physical systems such as electricity grid and water purification systems.

Network security: Protects internal networks from intruders by securing infrastructure. Examples of network security include the implementation of two-factor authentication (2FA) and new, strong passwords.

Application security: Uses software and hardware to defend against external threats that may present themselves in an application's development stage. Examples of application security include antivirus programs, firewalls and encryption.

Information security: Also known as InfoSec, protects both physical and digital data—essentially data in any form—from unauthorized access, use, change, disclosure, deletion, or other forms of malintent.

Cloud security: A software-based tool that protects and monitors your data in the cloud, to help eliminate the risks associated with on-premises attacks.

Data loss prevention: Consists of developing policies and processes for handling and preventing the loss of data, and developing recovery policies in the event of a cyber security breach. This includes setting network permissions and policies for data storage.

End-user education: Acknowledges that cyber security systems are only as strong as their potentially weakest links: the people that are using them. End-user education involves

teaching users to follow best practices like not clicking on unknown links or downloading suspicious attachments in emails—which could let in malware and other forms of malicious software.

TYPES OF CYBER THREATS:

The threats countered by cyber-security are three-fold:

1. Cybercrime includes single actors or groups targeting systems for financial gain or to cause disruption.
2. Cyber-attack often involves politically motivated information gathering.
3. Cyberterrorism is intended to undermine electronic systems to cause panic or fear.

MALWARE:

Malware means malicious software. One of the most common cyber threats, malware is software that a cybercriminal or hacker has created to disrupt or damage a legitimate user's computer. Often spread via an unsolicited email attachment or legitimate-looking download, malware may be used by cybercriminals to make money or in politically motivated cyber-attacks.

CONCLUSION:

The future of cybersecurity will in one sense be like the present: hard to define and potentially unbounded as digital technologies interact with human beings across virtually all aspects of politics, society, the economy, and beyond. That motion is more likely to accelerate than to decelerate, but its direction varies widely among our scenarios. Cybersecurity will be recognized widely as the "master problem" of the internet era. That puts it at the top of any list of problems that societies face, more similar to a nearly existential challenge like climate change than to an operational concern that technology companies have to manage.

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DATA ANALYTICS

SANIYA KULSUM (182MCA50)

INTRODUCTION

Data analytics is the science of analyzing raw data in order to make conclusions about that information. Many of the techniques and processes of data analytics have been automated into mechanical processes and algorithms that work over raw data for human consumption. Any type of information can be subjected to data analytics techniques to get insight that can be used to improve things.

HISTORY:

- The use of Analytics by business can be found as far back as the 19th century, when Frederick Winslow Taylor initiated time management exercises.
- In the late 1960s, Analytics began receiving more attention as computers became decision-making support systems.
- With the development of Big Data, Data Warehouses, the Cloud, and a variety of software and hardware, Data Analytics has evolved, significantly. Data Analytics involves the research, discovery, and interpretation of patterns within data.

FEATURES OF DATA ANALYTICS:

1. Intuitive Interface- It should allow the user to perform analytical operations through an intuitive interface without the use of coding or programming.
2. Data Blending Capabilities- Since the business users get data from various sources, the tool should have advanced data blending and enrichment capabilities.
3. Ready to Consume Insights- In today's fast paced business environment when a delay of seconds can dispel your customers, the tool should be able to deliver ready to consume business intelligence.
4. Easy to Share- It should have easy and controllable sharing capabilities to deliver insights over network in a multiuser environment.

ADVANTAGES OF DATA ANALYTICS

- It detects and correct the errors from data sets with the help of data cleansing. This helps in improving quality of data and consecutively benefits both customers and institutions such as banks, insurance and finance companies.

- It reduces banking risks by identifying probable fraudulent customers based on historic data analysis. This helps institutes in deciding whether to issue loan or credit cards to the applicants or not.

DISADVANTAGES OF DATA ANALYTICS:

- The cost of data analytics tools vary based on applications and features supported. Moreover some of the data analytics tools are complex to use and require training,

. This increases cost to the company willing to adopt data analytics tools or software

- The information obtained using data analytics can also be misused against group of people of certain country or community or caste.

TYPES OF DATA ANALYTICS

- Predictive analysis
- Big Data Analysis
- Cognitive Analysis
- Prescriptive Analysis
- Enterprise Decision Management
- Retail Analytics
- Augmented Analytics
- Web Analytics
- Call Analytics

CONCLUSION:

It is clear that when businesses bring data together, it is easier for them to get real-time insights about sales and finance, marketing, product development, and much more. Data allows the teams within a business to better collaborate, to achieve better results, and outsell rival companies.

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DIGITAL DEBIT

TEJASHWINI N (182MCA42)

INTRODUCTION:

Digital wallets are digital versions of your credit and debit cards stored in an app on your mobile device. You just enter your card information to get started. A digital wallet also known as "e-Wallet" refers to an electronic device or online service that allows an individual to make electronic transactions. This can include purchasing items on-line with a computer or using a smartphone to purchase something at a store.

HISTORY:

- In 1994 Mondex and National Westminster Bank provided an "electronic purse" to residents of Swindon
- In about 2005 Telefónica and BBVA Bank launched a payment system in Spain called Mobipay which used simple short message service facilities of feature phones intended for pay-as-you-go services including taxis and pre-pay phone recharges via a BBVA current bank account debit.
- In January 2010, Venmo launched as a mobile payment system through SMS, which transformed into a social app where friends can pay each other for minor expenses like a cup of coffee, rent and pay a share of the restaurant bill when one has forgotten their wallet. It is popular with college students, but has some security issues. It can be linked to a bank account, credit/debit card or have a loaded value to limit the amount of loss in case of a security breach. Credit cards and non-major debit cards incur a 3% processing fee.
- On 19 September 2011, Google Wallet released in the United States to make it easy to carry all one's credit/debit cards on a phone.
- In 2012 Ireland's O2 (owned by Telefónica) launched Easytrip to pay road tolls which were charged to the mobile phone account or prepay credit.
- The UK's O2 invented O2 Wallet at about the same time. The wallet can be charged with regular bank accounts or cards and discharged by participating retailers using a technique known as 'money messages'. The service closed in 2014.
- On 9 September 2014, Apple Pay was announced at the iPhone 6 event. In October 2014 it was released as an update to work on iPhone 6 and Apple Watch. It is very similar to Google Wallet, but for Apple devices only.

Features of Digital Debit

- Visa or MasterCard
- Linked bank account
- ATM access
- Chargeback
- Reward operation

Types of Digital Debit

- Banking cards
- USSD
- Aadhaar Enabled Payment System (AEPS)
- UPI
- Mobile Wallets
- Bank pre-paid cards
- Point of Sale (PoS)
- Internet Banking
- Mobile Banking
- Bharat Interface for Money (BHIM) app

Advantages of Digital Debit

- Low labor costs
- Convenience for online sales
- Automatic
- Fast transaction speed
- Low risk of theft

Disadvantages of Digital Debit

- Service fees
- Inconvenient for offline sales
- Vulnerability to cybercriminals
- Reliance on telecommunication infrastructure
- Technical problems

Conclusion:

Money is an object, record or anything that is generally acceptable for payment and repayment of economics debt in the economic context. Hence anything that is substituting money should be accepted as a medium of exchange and a store of value in an economy by all the players. Bank money can be described as the nonphysical form of money in supply in an economy. The major examples of bank money are direct deposits, cheques, money orders, debit cards and the other methods of money transfers.

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DIGITAL IMAGE PROCESSING

SANGEETHA.G (18MCA16)

Introduction

Digital Image Processing means processing digital image by means of a digital computer. We can also say that it is a use of computer algorithms, in order to get enhanced image either to extract some useful information.

For example: Adobe Photoshop, MATLAB, etc.

It is also used in the conversion of signals from an image sensor into the digital images.

A certain number of algorithms are used in image processing.

Image processing mainly include the following steps:

1. Importing the image via image acquisition tools;
2.Analysing and manipulating the image;
3.Output in which result can be altered image or a report which is based on analyzing that image.

Types of an image

1. **Binary Image**– The binary image as its name suggests, contain only two pixel elements i.e. 0 & 1, where 0 refers to black and 1 refers to white. This image is also known as Monochrome.
2. **Black and white Image**– The image which consist of only black and white color is called Black and white Image.
3. **8 bit Color Format**– It is the most famous image format. It has 256 different shades of colors in it and commonly known as Grayscale Image. In this format, 0 stands for Black, and 255 stands for white, and 127 stands for gray.
4. **16 bit Color Format**– It is a color image format. It has 65,536 a different color in it.It is also known as High Color Format. In this format the distribution of color is not as same as Grayscale image.

Phase of image Processing:

1. **Acquisition**– It could be as simple as being given an image which is in digital form.

The main work involves:
a) Scaling
b) Color conversion (RGB to Gray or vice-versa)

2. **Image Enhancement**– It is amongst the simplest and most appealing in areas of Image Processing it is also used to extract some hidden details from an image and is subjective.

3. **Image Restoration**– It also deals with appealing of an image but it is objective (Restoration is based on mathematical or probabilistic model or image degradation).

4. **Color Image Processing**– It deals with pseudo color and full color image processing color models are applicable to digital image processing.

5. **Wavelets and Multi-Resolution Processing**– It is foundation of representing images in various degrees.
6. **Image Compression**-It involves in developing some functions to perform this operation. It mainly deals with image size or resolution.

7. **Morphological Processing**-It deals with tools for extracting image components that are useful in the representation & description of shape.

8. **Segmentation procedure**-It includes partitioning an image into its constituent parts or objects. Autonomous segmentation is the most difficult task in Image Processing.

9. **Representation**-It follows output of segmentation stage, choosing a representation is only the part of solution for transforming raw data into processed data.

10. **Object detection**-It is a process that assigns a label to an object based on its descriptor.

Advantages of Digital Image Processing

- Image reconstruction (CT, MRI, SPECT, PET)
- Image reformatting (Multi-plane, multi-view reconstructions)
- Fast image storage and retrieval
- Fast and high-quality image distribution.
- Controlled viewing (windowing, zooming)

Disadvantages of Digital Image Processing

- It is very much time-consuming.
- It is very much costly depending on the particular system.

- Qualified persons can be used.

Conclusion

It uses software, and some are free of cost. It provides clear images. Digital Image Processing do image enhancement to recollect the data through images, It is used widely everywhere in many fields, It reduces the complexity of digital image processing, It is used to support a better experience of life.

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EDGE COMPUTING

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INTRODUCTION:

Edge computing is a distributed, open IT architecture that features decentralized processing power, enabling mobile computing and Internet of Things (IoT) technologies. In edge computing, data is processed by the device itself or by a local computer or server, rather than being transmitted to a data center.

HISTROY:

Edge computing can be traced back to the 1990s, when Akamai launched its content delivery network (CDN), which introduced nodes at locations geographically closer to the end user. These nodes store cached static content such as images and videos. Edge computing takes this concept further by allowing nodes to perform basic computational tasks.

In 1997, computer scientist Brain Noble demonstrated how mobile technology could use edge computing for speech recognition.

In 2009, "The Case for VM-Based Cloudlets in Mobile Computing" was published, detailing the end-to-end relationship between latency and cloud computing. The article advocated for a "two-level architecture: the first level is today's unmodified cloud infrastructure" and the second consisted of dispersed elements called cloudlets with state cached from the first level." This is the theoretical basis for many aspects of modern edge computing, and in 2012 Cisco introduced the term "fog computing" for dispersed cloud infrastructure designed to promote IoT scalability.

FEATURES:

The key feature of Edge Computing is the **ability of processing critical data locally**, then sending them to a central repository. Wikipedia source also states that the main benefit of edge technology is the reduction of data volumes that must be moved, the

consequent traffic, and the distance the data must travel. That provides lower latency and reduces transmission costs." Micro data center of Edge Computing not only allow to get higher bandwidth and lower latency, but they also ensure a greater security and privacy of data.

WHY DOES EDGE COMPUTING MATTERS?

For many companies, the cost savings alone can be a driver towards deploying an edge-computing architecture. Companies that embraced the cloud for many of their applications may have discovered that the costs in bandwidth were higher than they expected. Increasingly, though, the biggest benefit of edge computing is the ability to process and store data faster, enabling for more efficient real-time applications that are critical to companies. Before edge computing, a Smartphone scanning a person's face for facial recognition would

Need to run the facial recognition algorithm through a cloud-based service, which would take a lot of time to process. With an edge computing model, the algorithm could run locally on an edge server or gateway, or even on the Smartphone itself, given the increasing power of smart phones. Applications such as virtual and augmented reality, self-driving cars, smart cities and even building-automation systems require fast processing and response.

ADVANTAGES:

- Low Latency
- Real-Time Availability
- Real-Time Data Transmission
- Bring company and customer together
- Productivity Increase
- Consumer perspective it provide a digital experience

DISADVANTAGES:

- No or limited Redundancy
- Potential Loss or Corruption of data
- Longer Outage Time
- Higher Risk

CONCLUSION:

As IoT becomes more pervasive, edge computing will do the same.

- The ability to analyze data closer to the source will minimize latency, reduce the load on the internet, improve privacy and security, and lower data management costs.
- The cloud will continue to play a critical role in aggregating important data and performing analyses on this massive set of information to glean insights that can be distributed back to the edge devices.

- The combination of edge and cloud computing will help you better manage and analyze your data and significantly increase the value of your IoT efforts.

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ETHICAL HACKING

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Definition:

Ethical hacking is the process which is focuses on securing & protecting computer system. Independent computer security professional breaks into the computer system and neither damaged the target system nor steal the information, they evaluate target system security and report back to the owner about the threats found.

Types of Ethical Hacking:

Web application Hacking: Web applications provide an interface between end users and web servers through a set of web pages generated at the server end or that contain script code to be executed dynamically within the client Web browser.

Methods that can be used to hack web applications are SQL Injection attacks, Cross Site scripting (XSS), Cross Site Request Forgeries (CSRF), Insecure Communications, etc.

System Hacking: System hacking is itself a vast subject which consists of hacking the different software-based technological systems such as laptops, desktops, etc. System hacking is defined as the compromise of computer systems and software to gain access to the target computer and steal or misuse their sensitive information

Web server Hacking: Web content is generated in real time by a software application running at server-side So hackers attack on the web server to steal credential information, passwords, and business information by using DoS attacks, SYN flood, ping flood, port scan, sniffing attacks, and social engineering attacks.

Hacking Wireless Network: A wireless network is hacked by identifying the SSID by using network sniffing. Wireless cards when converted to Sniffing modes are called **monitor mode.** A hacker without being in the same building can sniff the network packets. The radio waves can be easily sniffed by the hacker from a nearby location.

Ethical hacking phases:

1. **Reconnaissance**: Reconnaissance is the process of information gathering. In this phase, the hacker gathers relevant information regarding the target system. These include detecting services, operating systems, packet-hops to reach the system, IP configuration etc.

2. **Scanning**: In the scanning phase, the hacker begins to actively probe the target machine or network for vulnerabilities that can be exploited. Tools like Nessus, Nexpose, and NMAP are widely used by hackers in this process.

3. **Gaining Access**: In this phase, the vulnerability located during scanning is exploited using various methods and the hacker tries to enter the target system without raising any alarms. The primary tool that is used in this process is Metasploit.

4. **Maintaining Access**: This is one of the most integral phases. In this phase, the hacker installs various backdoors and payloads onto the target system. Just in case you don't know, Payload is a term used for activities performed on a system after gaining unauthorized access. Backdoors help the hacker gaining quicker access onto the target system in the future.

5. **Clearing Tracks**: This process is an unethical activity. It has to do with the deletion of logs of all the activities that take place during the hacking process. Nonetheless, Ethical Hackers still have to perform this phase to demonstrate how a Black Hat Hacker would go about his activities.

Conclusion:

In the preceding sections we saw the definition of Ethical Hacking, types of Ethical Hacking, and process of Ethical Hacking. We should aware of hacking and some tools which a hacker may use. We should see what we can do against hacking or to protect ourselves from hacking.

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MOBILE APPLICATION DEVELOPMENT:

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INTRODUCTION:

Mobile Application Development refers to the process of making application software for handheld devices such as mobile phones and Personal Digital Assistants. Through the usage of mobile apps, the user is provided with various features that will enable him to fulfill all his needs and much more. Apps should be interactive to the users. Apps can be downloaded from various platforms such as Google Play Store and iOS App Store. The app is first tested using devices called emulators which is a software simulation of the actual hardware device and then finally field testing is performed. It is a Key application for mobile and embedded device.

HISTORY:

- 2009- Cupcake, eclair and donut is launched.
- 2010-Froyo and Gingerbread is launched.
- 2011-Honeycomb and Ice cream sandwich is launched.
- 2012-Jelly Bean is launched.
- 2013-Kitkat is launched.
- 2014-Lollipop is launched.
- 2015-2018-Marshmallow, Nougat, Oreo and pie is launched.
- 2019-Android 10 is launched.

Features:

- **Social media integration-**Transform sharing into a simple and profitable way for other people to get to know you. Such a declaration of consumer loyalty brings great introductory state of mind. Potential customers get these 'suggestions', which settle on you the clearest decision when they require the sort of services you offer.
- **Android and iOS-**These are two platforms to be basically enveloped. Both are to a great degree famous and utilized around the world. What merits saying, the former platform may bring about issues with its number of devices, thus the application ought to be particularly planned and altogether tried on every device you pick.
- **Good Performance-** Speed of loading mustn't keep users holding up. In any case, issues, for example, this, are generally checked by quality affirmation, which is a piece of software development. That is the reason
- **Security-**This issue is crucial to numerous applications. It is one of the primary themes of examination in the middle of you and programming engineers. No leaks of the users' private data are permitted.
- **Storage-**SQLite-relational DB.
- **Connectivity**- Supports(libraries)GSM/Edge,Bluetooth,WIFI

ADVANTAGES:

- Full access to the device, in software and hardware
- Simpler development at lower cost
- Reusable programming code

DISADVANTAGES:

- Internet connection absolutely necessary
- Limited access to the device's hardware
- Different programming languages and skills depending on operating system

TYPES OF MOBILE APP:

- Lifestyle mobile apps
- Social mobile apps
- Utility mobile apps
- Games/Entertainment mobile apps
- News/Information outlets mobile apps

Conclusion:

In the end, every business, big or small, will eventually need to develop a mobile app to allow customers to reach them from wherever they are. It's surprising how tapping into some of your phone's lesser known features can facilitate an engaging connection with your customers.

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ROBOTICS

MANISHA BURAGOHAIN (18MCA10)

INTRODUCTION

Robotics is a domain in artificial intelligence that deals with the study of creating intelligent and efficient robots. Robotics is a branch of AI, which is composed of Electrical Engineering, Mechanical Engineering, and Computer Science for designing, construction, and application of robots. Robots are aimed at manipulating the objects by perceiving, picking, moving, modifying the physical properties of object, destroying it, or to have an effect thereby freeing manpower from doing repetitive functions without getting bored, distracted, or exhausted.

HISTORY

- Generation 0: Pre-Robots (up to 1950).
- Generation 1: First Manipulators (1950-1967).
- Generation 2: Sensorized robots (1968-1977).
- Generation 3: Industrial robots (1978-1999).
- Generation 4: Intelligent robots (2000-2017)
- Generation 5: Collaborative and personal robots.

ADVANTAGES

- **Cost Effectiveness.**
- **Improved Quality Assurance.**
- **Increased Productivity.**
- **Work In Hazardous Environments.**

DISADVANTAGES

- **Potential Job Losses.**
- **Initial Investment Costs.**
- **Hiring Skilled Staff.**
- **Limitations.**

TYPES OF ROBOTICS

- Outer Space.
- The Intelligent Home.
- Exploration.
- Military Robots.
- Farms.
- The Car Industry.
- Hospitals.
- Disaster Areas
- Disaster Areas

CONCLUSION

Careful consideration and advice should be sought before investing in robots. Robots are useful in many ways. For instance, it boosts economy because businesses need to be efficient to keep up with the industry competition. Therefore, having robots helps business owners to be competitive, because robots can do jobs better and faster than humans can, e.g. robot can built, assemble a car. Yet robots cannot perform every job; today robots roles include assisting research and industry. Finally, as the technology improves, there will be new ways to use robots which will bring new hopes and new potentials.

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SERVERLESS COMPUTING

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Serverless computing is a method of providing backend services on an as-used basis. Servers are still used, but a company that gets backend services from a serverless vendor is charged based on usage, not a fixed amount of bandwidth or number of servers. The serverless name comes from the fact that the tasks associated with infrastructure provisioning and management are invisible to the developer. This approach enables developers to increase their focus on the business logic and deliver more value to the core of the business. Serverless computing helps teams increase their productivity and bring products to market faster and it allows organizations to better optimize resources and stay focused on innovation.

ADVANTAGES:

1. **No infrastructure management**: Using fully managed services enables developers to avoid administrative tasks and focus on core business logic. With a serverless platform, you simply deploy your code and it runs with high availability.
2. **Dynamic scalability**: With serverless computing, the infrastructure dynamically scales up and down within seconds to match the demands of any workload.
3. **Faster time to market**: Serverless applications reduce the operations dependencies on each development cycle, increasing development teams' agility to deliver more functionality in less time.

4. **More efficient use of resources**: Shifting to serverless technologies helps organizations reduce TCO and reallocate resources to accelerate the pace of innovation.
5. **Lower costs**: Serverless computing is generally very cost-effective, as traditional cloud providers of backend services (server allocation) often result in the user paying for unused space or idle CPU time.

SERVERLESS APPLICATION PATTERNS:

Developers build serverless applications using a variety of application patterns—many of which align with approaches that are already familiar—to meet specific requirements and business needs.

1. **Serverless functions**: Serverless functions accelerate development by using an event-driven model, with triggers that automatically execute code to respond to events and bindings to seamlessly integrate additional services. A pay-per-execution model with sub-second billing charges only for the time and resources it takes to execute the code.
2. **Serverless Kubernetes**: Developers bring their own containers to fully managed, Kubernetes-orchestrated clusters that can automatically scale up and down with sudden changes in traffic on spiky workloads.
3. **Serverless workflows**: Serverless workflows take a low-code/no-code approach to simplify orchestration of combined tasks. Developers can integrate different services (either cloud or on-premises) without coding those interactions, having to maintain glue code or learning new APIs or specifications.
4. **Serverless application environments**: With a serverless application environment, both the back end and front end are hosted on fully managed services that handle scaling, security and compliance requirements.
5. **Serverless API gateway**: A serverless API gateway is a centralized, fully managed entry point for serverless backend services. It enables developers to publish, manage, secure and analyses APIs at global scale.

DISADVANTAGES:

1. **Lack of Operational Tools**: The developers are dependent on vendors for debugging and monitoring tools. Debugging distributed systems is difficult and usually requires access to a significant amount of relevant metrics to identify the root cause.
2. **Architectural Complexity**: Decisions about how small (granular) the function should be, takes time to assess, implement and test. There should be a balance between the number of functions should an application call. It gets cumbersome to manage too many functions, and ignoring granularity will end up creating mini-monoliths.
3. **Implementation Drawbacks**: Integration testing of serverless apps is tough. Problems related to deployment, versioning, and packaging also exist. It also means you can't atomically deploy a group of functions and there's no concept of versioned applications so atomic rollback isn't an option. You may need to turn off whatever

event source is triggering the functions, deploy the whole group, and then turn the event source back on.

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SMART HOME DEVICES

MAMATHA.N (18MCA09)

INTRODUCTION:

A smart home refers to a residence equipped with a communication network, high-tech household devices, appliances, and sensors that can be remotely accessed, monitored, and controlled and that provide services responding to the residents' needs. Although the widespread diffusion of high-speed Internet in the late 1990s provided the opportunity for the home network business to grow, it was not until the late 2000s that smart homes began to be installed, which is when smart phones were popularized. Initially, a smart home was defined using various names, such as a home network, a digital home, home automation, and an intelligent home.

Smart Home Technology:

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- An alert to the system that it's issuing a command,

- An identifying unit number for the device that should receive the command and
- A code that contains the actual command, such as "turn off."

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- An alert to the system that it's issuing a command,
- An identifying unit number for the device that should receive the command and
- A code that contains the actual command, such as "turn off."

All of this is designed to happen in less than a second, but X10 does have some limitations. Communicating over electrical lines is not always reliable because the lines get "noisy" from powering other devices. An X10 device could interpret electronic interference as a command and react, or it might not receive the command at all. While X10 devices are still around, other technologies have emerged to compete for your home networking dollar. However, home automation networks don't need all the juice of a Wi-Fi network because automation commands are short messages. The two most prominent radio networks in home automation are ZigBee and Z-Wave. Both of these

Technologies are mesh networks, meaning there's more than one way for the message to get to its destination.

Features of Smart Home:

- **Z-Wave -** Z-Wave uses a Source Routing Algorithm to determine the fastest route for messages. Each Z-Wave device is embedded with a code, and when the device is plugged into the system, the network controller recognizes the code, determines its location and adds it to the network.
- **ZigBee-** ZigBee's name illustrates the mesh networking concept because messages from the transmitter zigzag like bees, looking for the best path to the receiver.
- **Insteon-** Using a wireless network provides more flexibility for placing devices, but like electrical lines, they might have interference.

ADVANTAGES:

- Energy Efficient
- Hands-free convenience
- Enhanced Security
- Save Time with Automated Tasks
- Customization

DISADVANTAGES:

- Cost
- Internet Reliance
- Setup and Configuration
- More Technical Security Threats
- Different Protocols (Z-Wave, ZigBee etc.)

Conclusion:

If these factors are taken into consideration, smart home services that have not been activated in the past will spread and the market will grow. People who are elderly or disabled benefit the most from a home automation system that employs artificial intelligence. These systems offer those who are less mobile, or in delicate health, the opportunity to be independent, rather than staying in an assisted living facility. Designing a Smart Home is also very crucial.

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CLOUD COMPUTING

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INTRODUCTION:

Cloud computing is the on-demand availability of computer system resources, especially data storage and computing power, without direct active management by the user. The term is generally used to describe data centers available to many users over the Internet. Large clouds, predominant today, often have functions distributed over multiple locations from central servers. If the connection to the user is relatively close, it may be designated an edge server.

FIVE MAIN CHARACTERSTICS OF CLOUD COMPUTING:

The five major characteristics of the Cloud Computing are as follows:

- **On-demand self-service** - The service of the cloud is available round the clock and provides computing capabilities on-demand of the user automatically.

- **Broad network access** - Users can access the services via different modes as the heterogeneous thin and thick client platforms.
- **Resource pooling** - The feature of multi-tenancy where users are assigned resources dynamically, based on demands.
- **Rapid elasticity**– The service is flexible and can be scaled up or down to suit the business requirements. Resources and programs can be used based on requirement and the user is billed only for the usage.
- **Measured service** – Usage metering is available and you pay only for what you use. You need not pay for any infrastructure that you do not use.

Service Models

There are different service models in Cloud computing. With the advancement of technology, newer service models are evolving. However there are 3 major service models for Cloud Computing. These are Iaas, Paas, and SaaS.

Iaas – In Infrastructe as a Service, users can access the infrastructure required to run their applications, storage, operating systems, etc. The infrastructure can be servers, storage, and virtualization infrastructure and so on. Buying and installing these infrastructure can be very expensive process for the organizations. And more expense would be there on the maintenance part. So the IaaS model is a reliable and cost effective method for the users to run their businesses.

Paas – In Platform as a Service, users are provided the platform to develop and run their applications. Changing the platform, upgrading to a newer version, or maintaining uniformity in the platform used by all employees of a company is possible at a less expenditure with PaaS. For example, if you are working on an experimental project where you wouldn't want to spend more on the development, you can opt for PaaS. This way, you save money and effort by not having the need to buy the platforms and hire people to maintain them.

SaaS – In Software as a Service, user can access software applications from the cloud. You no longer would need to buy the expensive software. You can access the software through a thin client interface, like a web browser. Similar to the other service models, you cannot control the underlying infrastructure. You can run the applications in the cloud and the cloud administrator manages the portions.

Deployment Models

Public Cloud

In this model, the infrastructure is accessible to the public and it is owned by a vendor, who offers the services of the cloud to the users. The cloud vendor shares the cloud resources with the end users. The resource pool is huge and the services are shared by lots of users. The services of this cloud model can be free or available for nominal charges. Google uses a public cloud deployment model. With this model, users need not purchase any infrastructure but can use that of the vendor. A drawback of the public cloud model is that it poses a security threat. If you have very confidential data running in your network, it is not safe to use the public cloud model.

Hybrid Cloud

The Hybrid Cloud deployment model comprises of two or more clouds. This can be a combination of the other three cloud types – public, private, or community. The hybrid deployment is complex compared to the other three owing to the execution and management tasks involved. An example scenario of this model can be where an organization is on the private cloud but there are load spikes which the private cloud cannot handle. For this the organization depends on the public cloud to support the load. The shift from the private to the public cloud and back will be seamless to the end user.

Community Cloud

In the Community Cloud model, the infrastructure is owned jointly by different organizations. The organizations may have a similar set of requirements, policies, and customer base. So, they can combine the offerings and make the customer base even bigger. Duplication of same or similar applications and resources are avoided. This model helps reduce the costs, which would otherwise be higher if the organization deploys the Private Cloud model. This is again a classification of the Private Cloud, as it is available to only a certain group of users.

CONCLUSION: Cloud computing is the fastest growing part of IT

Tremendous benefits to customers of all sizes. Cloud services are simpler to acquire and scale up or down

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5G WIRELESS TECHNOLOGY

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I.INTRODUCTION:

Wireless communication has started in early 1970s. In next four decades, a mobile wireless technology has evolved from 1G to 5G generations. Fifth generation technology offer very high bandwidth that user never experienced before. The Fifth generation technologies offer various new advanced features which makes it most powerful and in huge demand in the future

II.EVOLUTION OF WIRELESS TECHNOLOGIES:

1. First Generation (1G) 1G emerged in 1980s. It contains Analog System and popularly known as cell phones. It introduces mobile technologies such as Mobile Telephone System (MTS), Advanced Mobile Telephone System (AMTS), Improved Mobile Telephone Service

(IMTS), and Push to Talk (PTT). It uses analog radio signal which have frequency 150 MHz, voice call modulation is done using a technique called Frequency-Division Multiple Access (FDMA).

2. **Second Generation (2G)** 2G emerged in late 1980s. It uses digital signals for voice transmission and has speed of 64 kbps. It provides facility of SMS (Short Message Service) and use the bandwidth of 30 to 200 KHz. Next to 2G, 2.5G system uses packet switched and circuit switched domain and provide data rate up to 144 kbps. E.g. GPRS, CDMA and EDGE

3. Third Generation (3G) it uses Wide Brand Wireless Network with which clarity is increased. The data are sent through the technology called Packet Switching. Voice calls are interpreted through Circuit Switching. Along with verbal communication it includes data services, access to television/video, new services like Global Roaming.

4.**Fourth Generation(4G)** 4G offers a downloading speed of 100Mbps.4G provides same feature as 3G and additional services like Multi-Media Newspapers, to watch T.V programs with more clarity and send Data much faster than previous generations. LTE (Long Term Evolution) is considered as 4G technology. 4G is being developed to accommodate the QoS and rate requirements set by forthcoming applications like wireless broadband accessed.

III.5G ARCHITECTURE:

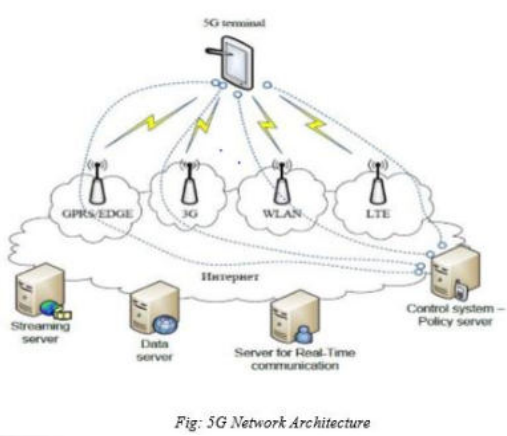

Fig: 5G Network Architecture

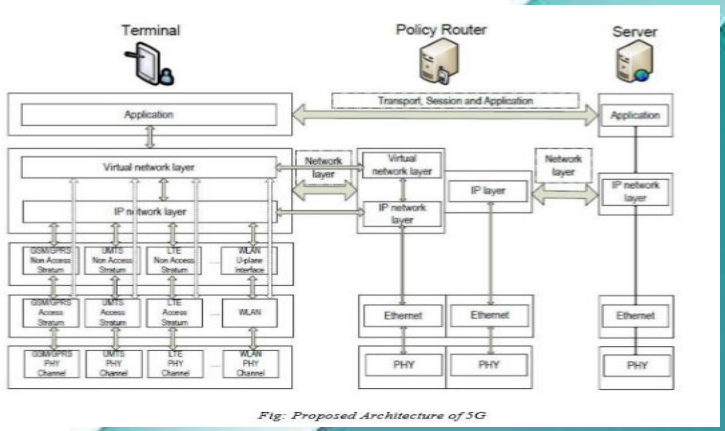

Fig: Proposed Architecture of 5G

Next Generation Networks (NGN) consists of support functionalities for data transport, and control transport, as well as functionalities for support of services and applications. The measurement of traffic is a basic control activity in order to provide Quality of Service. In addition 5G communication system is designed by the finest Quality of Service (QoS). The primary goal of quality of service is to provide priority to networks, including dedicated bandwidth, controlled jitter, low latency and improved loss characteristics. Its technologies supply the elemental building blocks that will be used for future business applications in campus, wide area networks and service provider networks. There are three fundamental components for basic QoS implementation: • Identification and marking techniques for coordinating QoS from end to end between network elements. • QoS within a single network element. • QoS policy, management, and accounting functions to control and administer end-to-end traffic across a network.

V.WHY 5G? :

• 5G technology use remote management that user can get better and fast solution.

• The uploading and downloading speed of 5Gtechnology is very high.

• 5G technology offer high resolution for crazy cell phone user and bi-directional large bandwidth shaping.

• 5G technology offer transporter class gateway with unparalleled consistency.

VI. CONCLUSION:

The development of the mobile and wireless networks is going towards higher data rates and all-IP principle. Mobile terminals are obtaining each year more processing power, more memory on board, and longer battery life for the same applications. 5G include latest technologies such as cognitive radio, SDR, nanotechnology, cloud computing and based on All IP Platform. It is expected that the initial Internet philosophy of keeping the network simple as possible, and giving more functionalities to the end nodes, will become reality in the future generation of mobile networks, here referred to as 5G.

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COMPUTER VISION

SUDESHNA BOSE (18MCA19)

Introduction

Computer vision is an interdisciplinary scientific field that deals with how computers can gain high-level understanding from digital images or videos. From the perspective of engineering, it seeks to understand and automate tasks that the human visual system can do. Computer vision tasks include methods for acquiring, processing, analyzing and understanding digital images, and extraction of high-dimensional data from the real world in order to produce numerical or symbolic information, e.g. in the forms of decisions. "Computer vision is concerned with the automatic extraction, analysis and understanding of useful information from a single image or a sequence of images. It involves the development of a theoretical and algorithmic basis to achieve automatic visual understanding."

History:

In the late 1960s, computer vision began at universities which were pioneering artificial intelligence. It was meant to mimic the human visual system, as a stepping stone to endowing robots with intelligent behavior.

Working Principle:

On a certain level Computer vision is all about pattern recognition. So one way to train a computer how to understand visual data is to feed it images, lots of images thousands, millions if possible that have been labeled, and then subject those to various software techniques, or algorithms, that allow the computer to hunt down patterns in all the elements that relate to those labels. Each pixel's brightness is represented by a single 8-bit number, whose range is from 0 (black) to 255 (white). In point of fact, pixel values are almost universally stored, at the hardware level, in a one-dimensional array.

Evolution of Computer Vision:

The tasks that computer vision could perform were very limited and required a lot of manual coding and effort by developers and human operators. Machine learning provided a different approach to solving computer vision problems. It helped solve many problems that were historically challenging for classical software development tools and approaches. Deep learning provided a fundamentally different approach to doing machine learning. Deep learning relies on neural networks, a general-purpose function that can solve any problem representable through examples.

Applications of Computer Vision:

- CV In Self-Driving Cars
- CV In Facial Recognition
- CV In Augmented Reality & Mixed Reality
- CV In Healthcare

Challenges of Computer Vision:

- Object Classification
- Object Identification
- Object Verification
- Object Detection

Outside of just recognition, other methods of analysis include:

- Video motion analysis
- Image segmentation
- Scene reconstruction.
- Image restoration,

Conclusion

Multiple health care institutions and enterprises have found ways to apply CV systems to real-world problems. But in many field still work is going on in CV. This trend is not likely to stop anytime soon.

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COMPUTER NETWORKING

AFRIN SULTANA (183MCA43)

INTRODUCTION

A **computer network** is a group of devices connected with each other through a transmission medium such as wires, cables etc. These devices can be **computers**, printers, scanners, Fax machines etc. The purpose of having **computer network** is to send and receive data stored in other devices over the **network**.

HISTORY

The idea of ARPANET, one of the earliest **computer networks**, was proposed by Leonard Kleinrock in 1961, in his paper titled "Information Flow in Large Communication Nets." The

term "packet" was coined by Donald Davies in 1965, to describe data sent between **computers** over a **network**.

FEATURES ON COMPUTER NETWORKS

- Communication speed.
- File sharing.
- Back up and Roll back is easy.
- Software and Hardware sharing.
- Security.
- Scalability.
- Reliability.

ADVANTAGES

- It enhances communication and availability of information.
- It allows for more convenient resource sharing.
- It makes file sharing easier.
- It is highly flexible.
- It is an inexpensive system.
- It increases cost efficiency.
- It boosts storage capacity.
- It lacks independence.

DISADVANTAGES

- Cost of **network**. The cost of implementing the **network** including cabling and hardware can be pricey.
- Security Concerns. One of the chief downsides of **computer networks** involves security issues.
- Virus and Malware.
- Lack of Robustness.
- Needs an Efficient Handler.
- Lack of Independence.

TYPES OF COMPUTER NETWORKS

- Local Area **Network** (LAN)
- Metropolitan Area **Network** (MAN)
- Wide area **network** (WAN)

CONCLUSION

A **network** is two or more **computers** connected together using a telecommunication system for the purpose of communicating and sharing resources. ... As you can see, **Networks** have many benefits to the end user. Weather your **Network** is Wired or Wireless, **Networks** are an important part of technology.

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DIGITAL TWIN

MADHU SHREE S (182MCA27)

Introduction

Digital twins are the virtual replica of real-world devices, processes or even persons. It is also referred as "Digital Shadow". This concept and model was introduced by Grieves and the idea first arose at NASA. Digital twin technology has moved beyond manufacturing and into the merging worlds of Internet of Things, artificial intelligence and data analytics. Digital twin is a computer program that takes real-world data about a physical object or system as inputs and produces predications or simulations of how that physical object will be affected by those inputs.

Working of Digital Twin

- To create a digital twin of any physical asset, the engineers collect and synthesize the data from various sources including physical data, manufacturing data, operational data and insights from analytics software.
- All this information along with AI algorithms is integrated into a physics-based virtual model and by applying insights regarding the physical asset.
- The consistent flow of data helps in getting the best possible analysis regarding the asset which helps in optimizing the business outcome.
- Thus, the digital twin will act as a live model of the physical equipment.

Digital Twin Applications

- **Manufacturing**: Digital Twin makes manufacturing more efficient and optimized while reducing the throughput times.
- **Automobile:** Digital twin can be used in automobile sector for creating the virtual model of a connected vehicle.
- **Healthcare:** It plays a key role in health care sector from cost savings to patient monitoring, preventative maintenance and providing personalized healthcare.
- **Industrial IoT:** Industrial firms with digital twin implementation can monitor, track and control industrial systems digitally.

Why Digital Twin Technology is important?

- Digital Twins are powerful masterminds to drive innovation and performance.
- This technology helps the companies
    - To improve the customer experience by better understanding the customer needs.
    - develop enhancements to existing products
    - operations and services
    - And can even help drive the innovation of new business.

Benefits of Digital Twin

- Maintenance cost reduction and predictability.
- Increase uptime and reliability assets.
- Reduced risk in various areas including product availability, marketplace etc...
- Faster production times.

Challenges of Digital Twin

- Due to the variability, uncertainty and fuzziness of physical space, building models in virtual space to mirror entities with high fidelity is a fundamental issue.
- Security is another focus that ensures the normal operation of physical and virtual spaces against the malicious.

- As the continuous physical space and discrete virtual space are in different scales, how to transcend the divergence to realize the seamless integration of two sides is challenging.

Conclusion:

Digital twins are transforming business environments by creating perfect experiences for employees. With the development of digital twins, new technologies are being developed every day. Digital twin have played an important role in ensuring its adoption in various industries and predictions are that it will continue to a higher adoption rate.

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