MAY
2020

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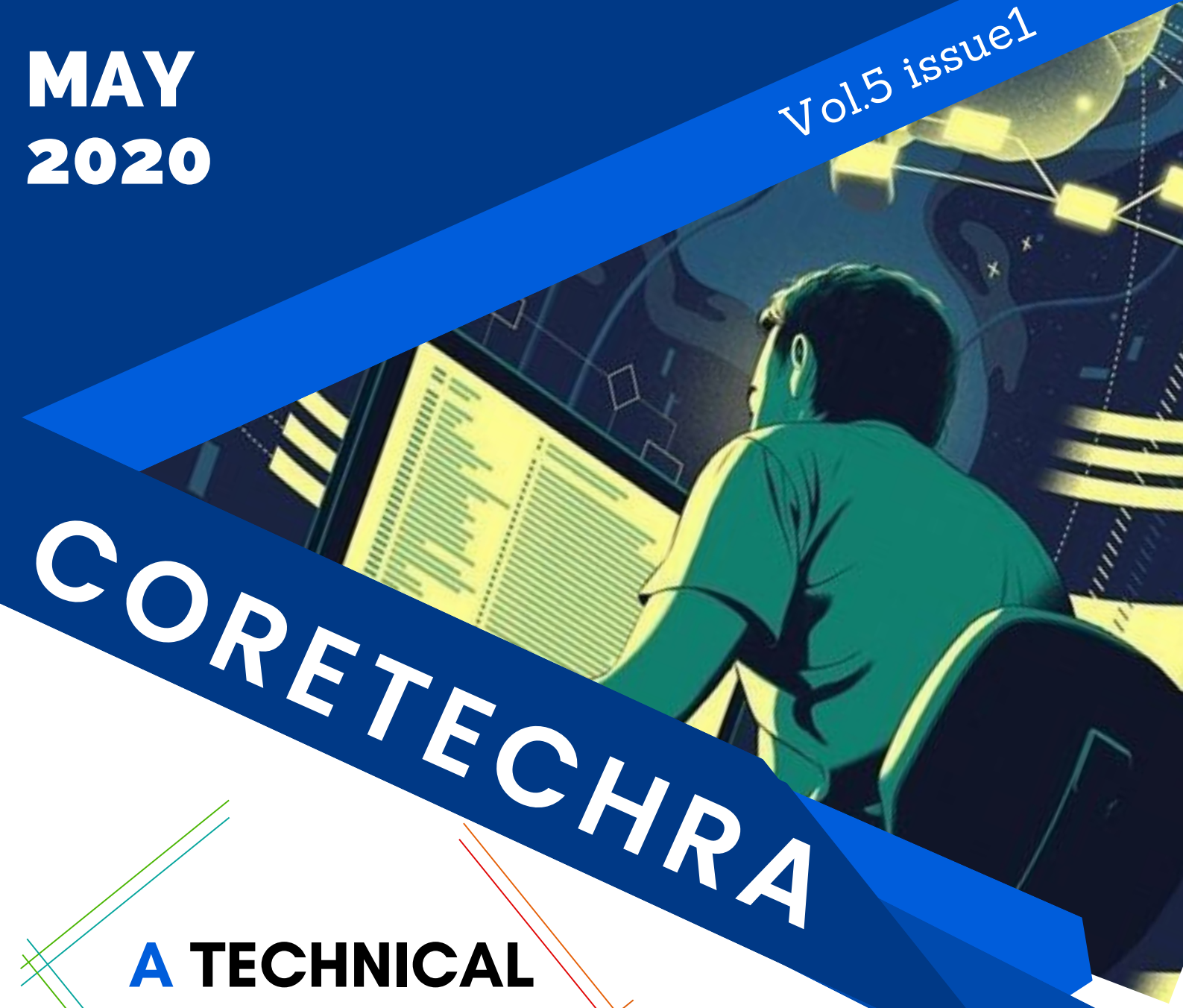


CORETECHRA

A TECHNICAL MAGAZINE

KARPAGAM
INSTITUTE OF TECHNOLOGY
INSPIRING INNOVATION

ABOUT

OUR DEPARTMENT

OUR MISSION

To produce technically competent and skilled engineers to meet the challenges of the IT industry

OUR VISION

- **Establishing innovative teaching learning practices with competent faculty and state of the art facilities.**
- **Enriching knowledge on latest technological advancements through industrial collaborations.**
- **Developing moral and ethical values through extension activities.**

PROGRAM EDUCATIONAL OBJECTIVES (PEOS)

PEO 1:

The graduates will have a successful career in the field of Information Technology and related domains.

PEO 2:

The graduates will provide solutions by applying analytical skills for the real-world problems in IT Industry.

PEO 3:

The graduates will involve in lifelong learning and as part of team in multidisciplinary projects with ethical values.

PROGRAM SPECIFIC OUTCOMES (PSOS)

PSO 1:

Identify, formulate and solve engineering problems by applying programming concepts and algorithmic principles in the field of IT.

PSO 2:

Analyze, design and develop Software applications, Networking and Data Management technologies for efficient IT based systems.

TABLE OF CONTENTS

AI-AS-A-SERVICE

Artificial Intelligence is more intelligent demonstrated by machines, fully opposed to the natural intelligence shown by human and animals.

AI research has been defined as the field of studyingabout intelligent agents, which refers to any system that productiveto this environment and takes actions that maximize its chance to increase the achievements goals.

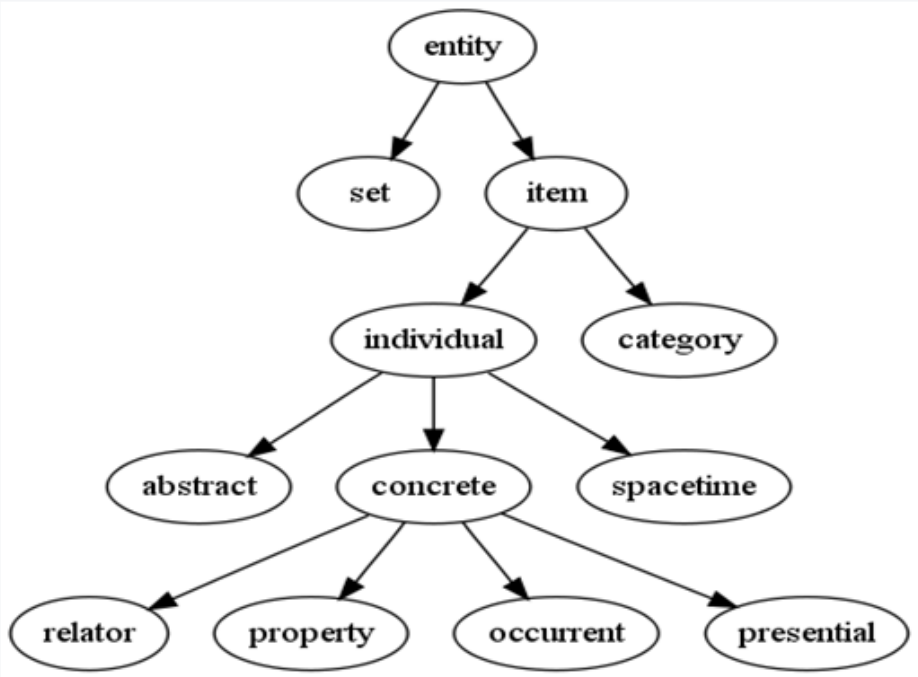
The term "artificial intelligence" have used by human beings as a machines that are associated with the human mind, such as "learning" and "problem-solving". The definition given in early stages was rejected by major AI researchers who now describe AI in terms of rationality and acting rationally, which does not limit how intelligence can be articulated.

GOALS

In the generation AI are majorly used for service to human being, so all technology used in AI for help human to do the work easier, faster and accurate. So we are making the AI to know the problems faced by the humans and control or help the humans to get out from the problem…

KNOWLEDGE REPRESENTATION

Ontology is a formalised description of a set of things, relationships, concepts, and qualities that software agents can use to comprehend "what exists." Upper ontologies, which aim to serve as a foundation for all other knowledge and serve as intermediaries between domain ontologies that encompass specific knowledge about a particular knowledge topic, are the most generic types of ontologies (field of interest or area of concern). The set of facts that the average person is familiar with would likewise need to be available to a fully intelligent programme. The Web Ontology Language, for example, uses description logic to represent the semantics of ontologies.



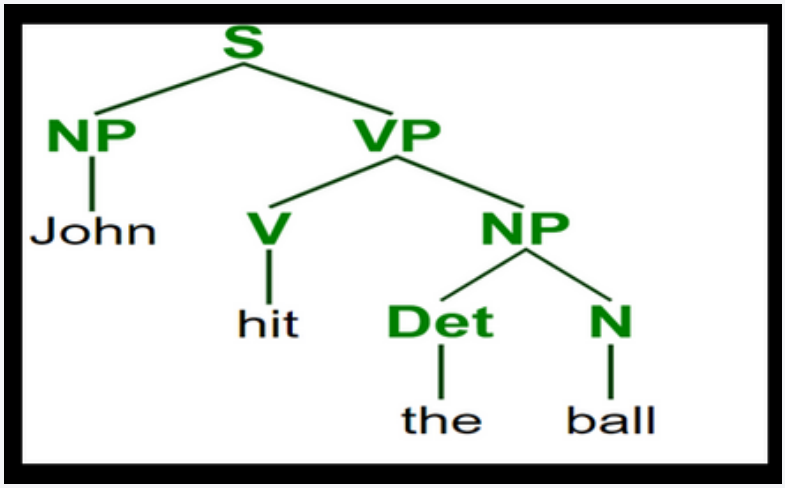
The above diagram is ontology represents knowledge as a set of concepts within a domain and the relationships between those concepts.

PLANNING

An intelligent being with the ability to plan creates a model of the environment, predicts how their actions will alter it, and makes decisions that maximise the utility (or "value") of the options at hand. The agent can be certain of the outcomes of its activities in classical planning problems by making the assumption that it is the only system acting in the world. If the agent is not the sole actor, though, it must be able to make decisions in the face of ambiguity, constantly examine its surroundings, and adapt. To accomplish a certain objective, multi-agent planning employs the collaboration and rivalry of numerous agents. Swarm intelligence and evolutionary algorithms both make advantage of emergent behaviour like this.

NATURAL LANGUAGE PROCESSING

Machines can read and comprehend human language thanks to a process called natural language processing (NLP). The direct acquisition of knowledge from human-written sources, such as newswire texts, and natural-language user interfaces are both made possible by sufficiently sophisticated natural language processing systems. Information retrieval, question-answering, and machine translation are some simple NLP applications.



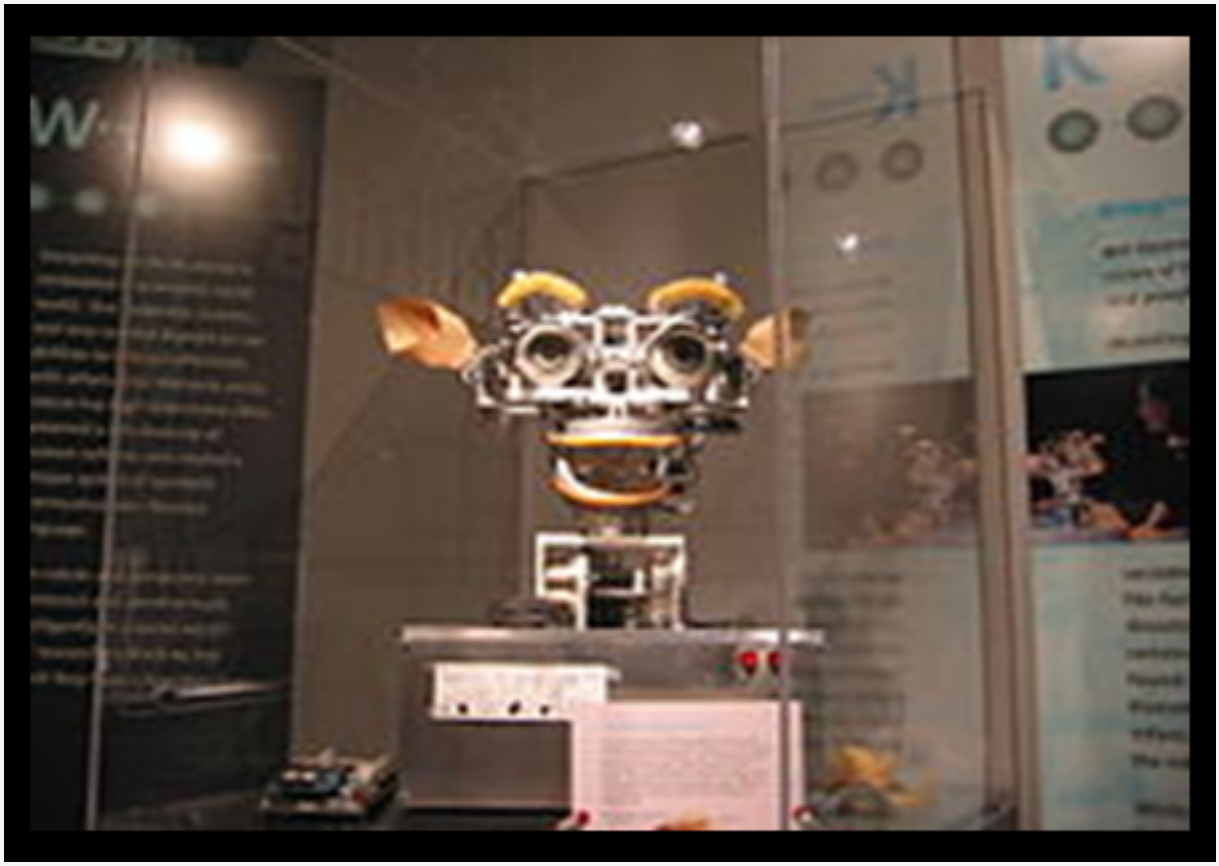
PERCEPTION

AI can create valuable abstract structures out of raw data with the aid of feature detection (seen here as edge detection). Machine perception is the capacity to infer features of the outside environment using input from sensors (such as cameras, microphones, wireless communications, active lidar, sonar, radar, and tactile sensors). Object, facial, and speech recognition are examples of applications. The capability to evaluate visual information is known as computer vision.

The above diagram is ontologyrepresents knowledge as a set of concepts within a domain and the relationships between those concepts.

SOCIAL INTELLIGENCE

Robot Kismet, who possesses minimal social abilities. Systems that perceive, interpret, process, or replicate human feeling, emotion, and mood fall under the interdisciplinary umbrella of affective computing. To look more receptive to the emotional dynamics of human connection, for instance, or to simply enhance human-computer interaction, some virtual assistants are programmed to speak informally or even joke around. However, this sometimes gives inexperienced users an incorrect impression of how intelligent current computer agents are. Textual sentiment analysis and multimodal sentiment analysis are two moderately successful applications of emotional computing where AI is used to categorise the affects expressed by a filmed subject



ANANDHARAJ
III - IT

5G DATA NETWORK

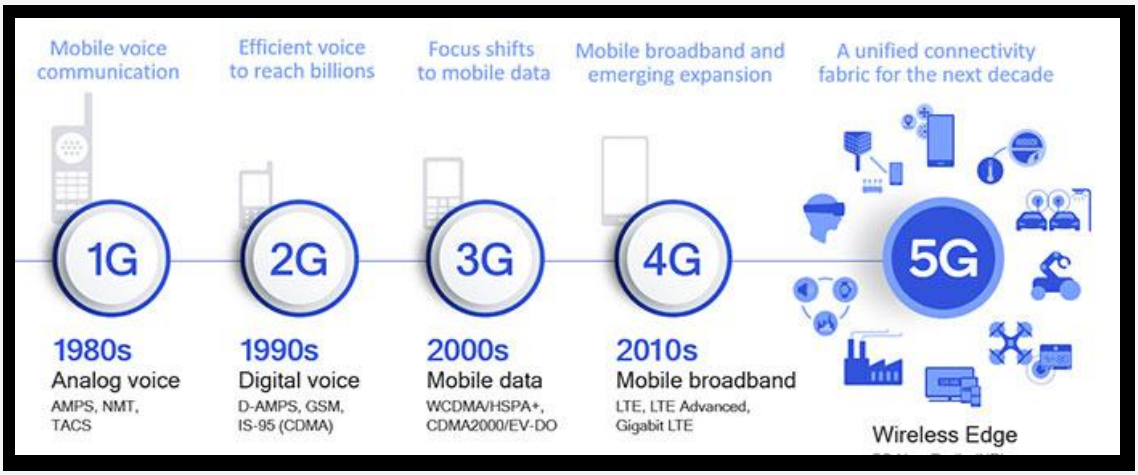
The fifth generation of mobile networks, or 5G. Following 1G, 2G, 3G, and 4G networks, it is a new international wireless standard. In order to connect practically everyone and everything together, including machines, objects, and gadgets, 5G enables a new type of network. The goal of 5G wireless technology is to provide more users with faster peak data speeds of multiple gigabits per second, ultralow latency, increased reliability, vast network capacity, and a more consistent user experience. New user experiences are enabled by increased performance and efficiency, which also connects new industries.

WHAT IS 5G?

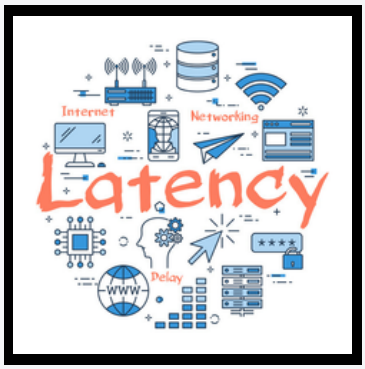
The fifth-generation (5G) technological standard for broadband cellular networks, which cellular phone providers started rolling out globally in 2019, is the anticipated replacement for the 4G networks that connect the majority of modern cell phones. By 2025, the GSM Association and Statista project that 5G networks will have more than 1.7 billion subscribers and represent 25% of the global market for mobile technology.

SPEED

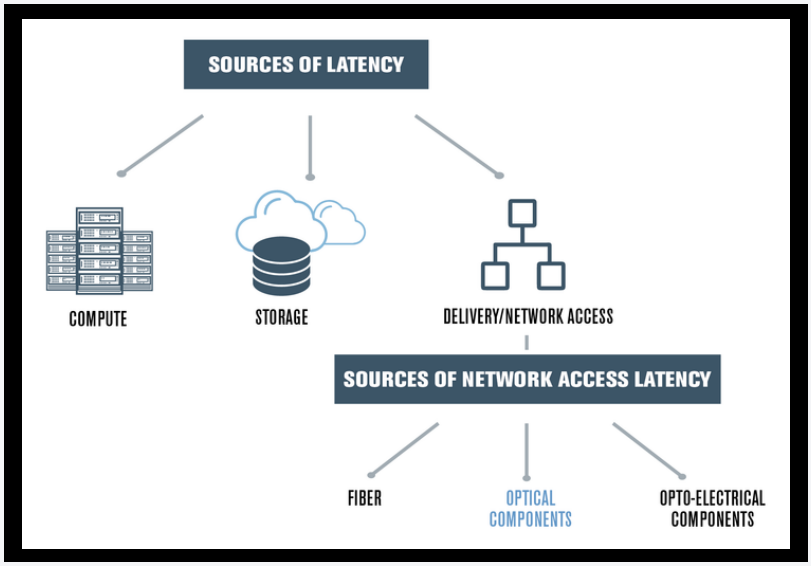
Based on the RF channel and BS load, 5G speeds will range from about 50 Mbps to 1,000 Mbps (1 GB/s). The mm Wave bands would have the fastest 5G speeds, reaching 4 GB/s with carrier aggregation and MIMO (assuming a perfect channel and no other BS load). In comparison to millimetre Wave bands, sub-6 GHz 5G (mid-band) may give speeds of between 10 and 1,000 Mbps and is by much more prevalent. Several U.S. companies will use C-Band (n77/n78) in the sub-6 bands. The deployment of C-Band by Verizon and AT&T was scheduled for early January 2022; however it was postponed because of safety concerns expressed by the Federal Aviation Administration. Low bands (like n5) have a wider range; thereforea site can cover a larger region, although their speeds are slower than those of the mid and high bands.



LATENCY

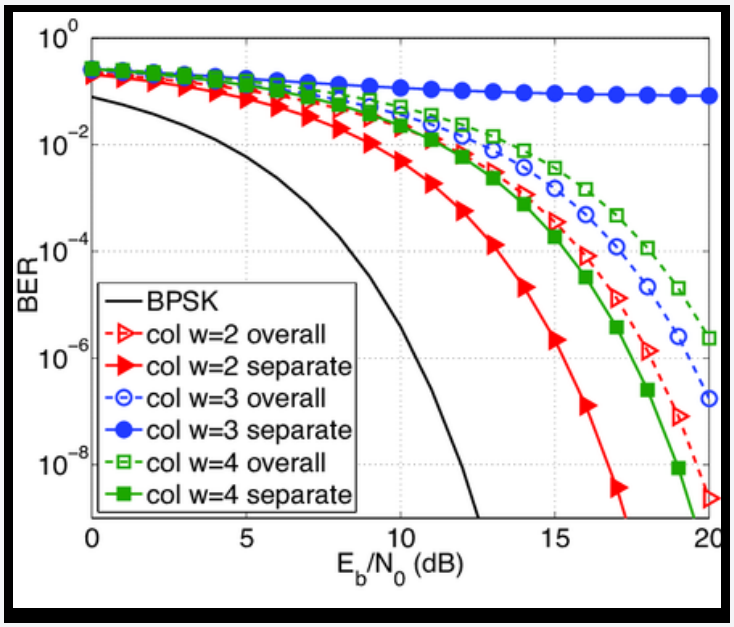


The optimal "air latency" for 5G is between 8 and 12 milliseconds, eliminating HARQ retransmissions and other delays. For accurate comparisons, "air latency" must be multiplied by backhaul latency to the server and retransmission latency. According to Verizon, the 5G early deployment's latency is 30 ms. The latency can likely be reduced to 10–15ms by edge servers located near the towers. Depending on the type of handover, latency increases significantly during handovers, ranging from 50 to 500 milliseconds. Research and development efforts are still being made to cut down on handover interruption time.



ERROR RATE

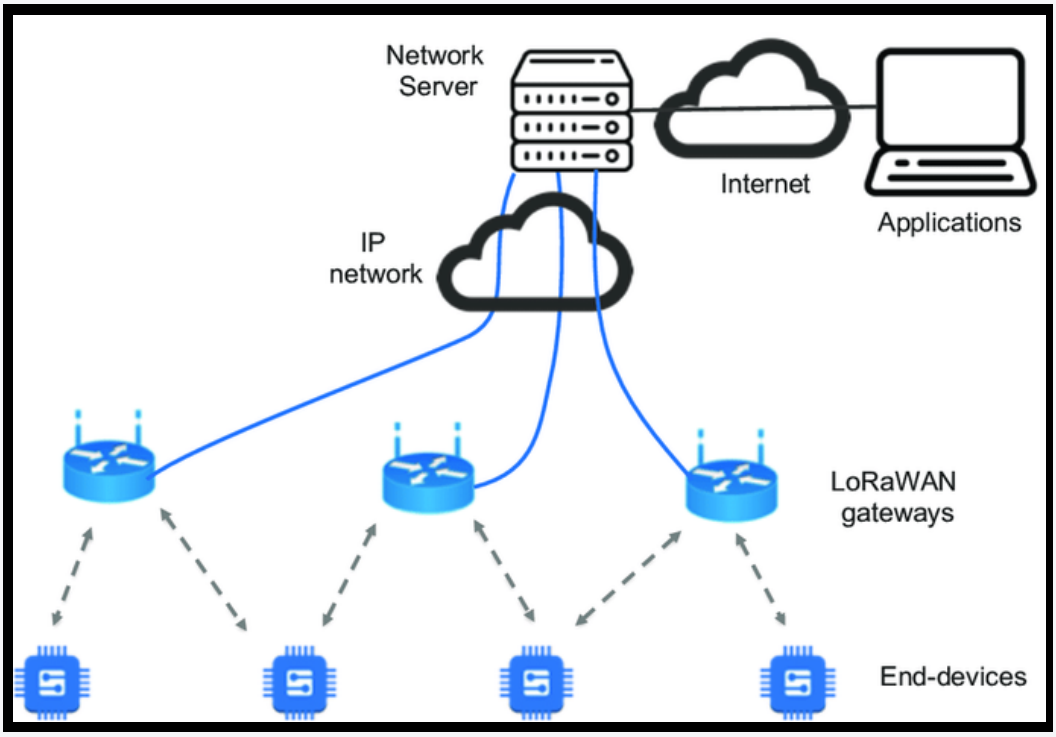
The very low bit error rate (BLER) of 5G is achieved by using an adaptive Modulation and Coding Scheme (MCS). A lower MCS, which is less error-prone, will be used by the transmitter whenever the error rate exceeds a (very low) threshold. Speed is traded in this way to guarantee a nearly error-free system.

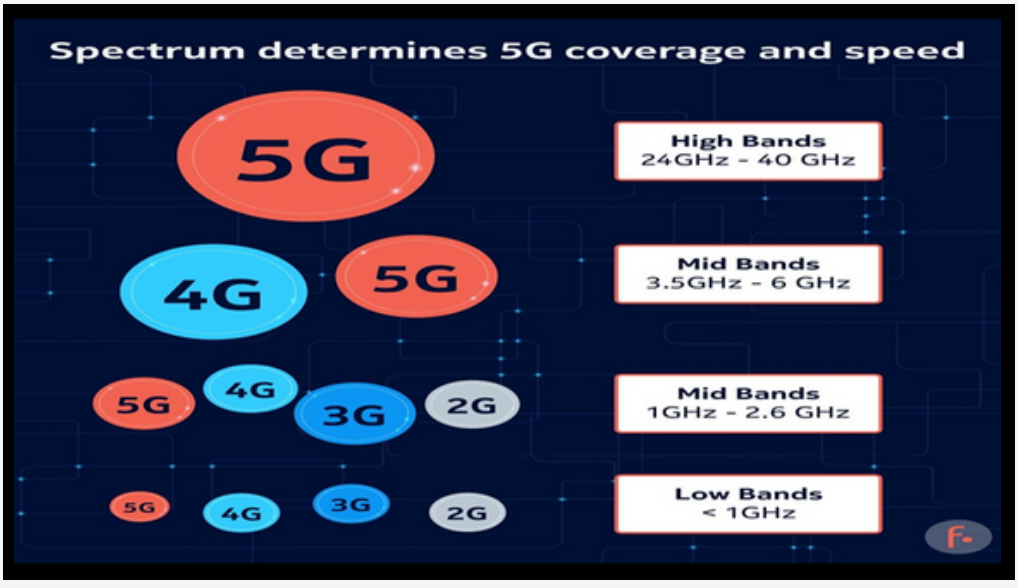


A measurement of the proportion of errors occurring in data transfers to or from the storage medium. It is usually expressed in terms of the average number of bytes or bits of data transferred per error, e.g. 1 error per 109 bytes, although it can also be useful to express the rate as the average time between errors for typical usage of the subsystem, e.g. 1 undetected error in 6 weeks at 10% duty cycle.

RANGE

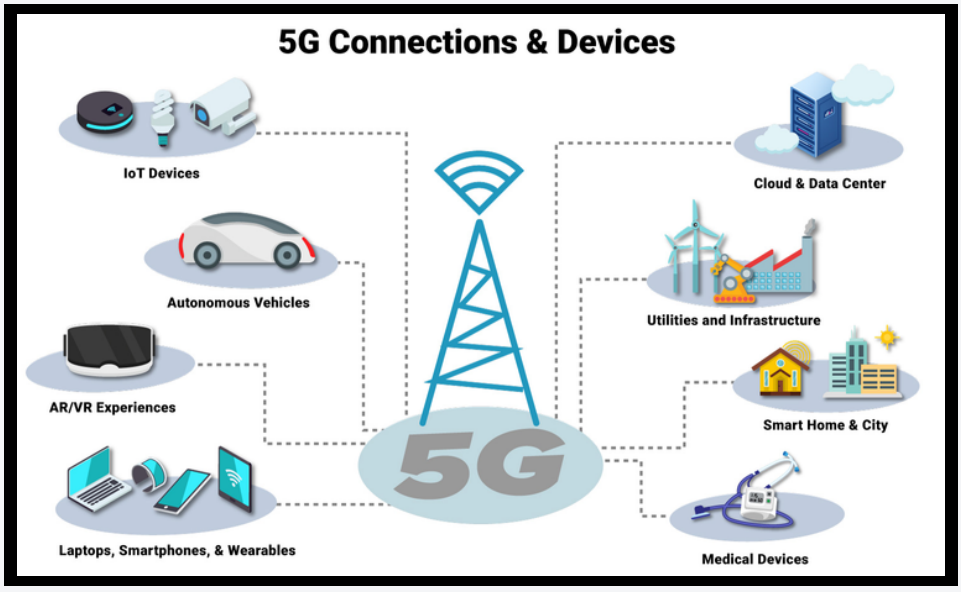
Transmit power, frequency, and interference are just a few of the variables that affect 5G's range. At mmWave frequencies, range is sacrificed for speed. Testing of the mmWave 5G service range has yielded findings that are 500 metres or less from the tower, indicating that massive propagation of MIMO-enabled antenna arrays would be necessary for pure standalone 5G deployments.





5G DEVICES

The Global Mobile Suppliers Association published the first database in the sector tracking the launch of 5G devices globally in March 2019. The GSA listed 23 companies who had confirmed the availability of 33 various 5G devices, including regional versions, from the upcoming wave of 5G equipment. Seven 5G device form factors were announced: smartphones (12 devices), hotspots (4 devices), indoor and outdoor customer premises equipment (8 devices), modules (5 devices), Snap-on dongles and adapters (2 devices), and USB terminals (1 device). By October 2019, 129 5G devices spanning 15 form factors from 56 vendors had been revealed.

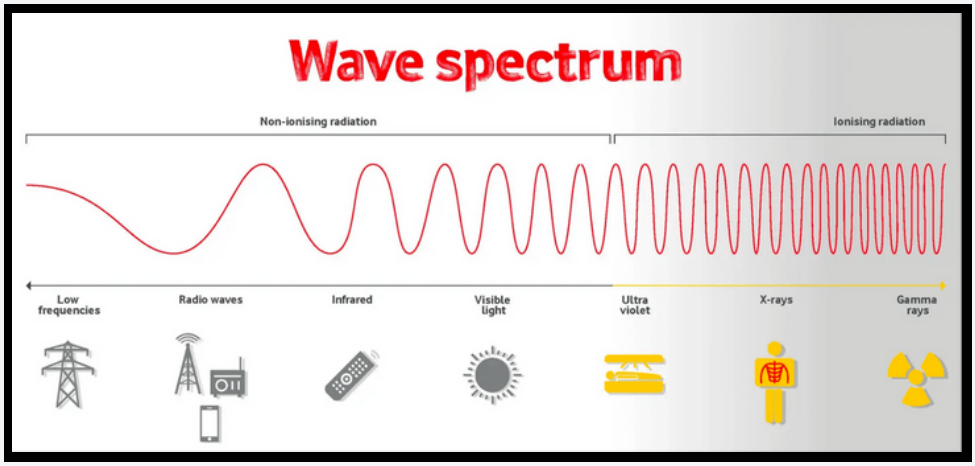


In telecommunications, 5G is the fifth-generation technology standard for broadband cellular networks, which cellular phone companies began deploying worldwide in 2019, and is the planned successor to the 4G networks which provide connectivity to most current cellphones. 5G networks are predicted to have more than 1.7 billion subscribers and account for 25% of the worldwide mobile technology market by 2025, according to the GSM Association and Statista.

HEALTH ISSUES

Before the development of 5G technology, there has been a lengthy history of worry and apprehension about wireless transmissions. The worries around 5G are comparable to those that existed throughout the 1990s and 2000s. They mostly focus on outlandish allegations that non-ionizing radiation is harmful to human health. Non-ionizing radiation cannot strip an atom of its electrons, in contrast to ionising radiation. According to the CDC, "Tissue damage due to heat may happen from exposure to severe, direct doses of non-ionizing radiation. This is uncommon, and people who work with large apparatus and machines that produce non-ionizing radiation should be especially cautious. Some proponents of alternative medicine contend that regulatory requirements are too lax and are swayed by lobbying organisations.

A 5G testing was halted in April 2019 in Brussels, Belgium, due to radiation regulations. The same rationale led to the cancellation of a 5G upgrade that was scheduled for Geneva, Switzerland. According to the Swiss Telecommunications Association (ASUT), research has not been able to demonstrate any negative effects on health from 5G frequencies.



OTHER APPLICATIONS

- **AUTOMOBILES**

The 4G-first C-V2X communication technology has been promoted by the 5G Automotive Association.It enables communication between infrastructures and automobiles.

- **DIGITAL TWINS**

A digital twin that replicates the physical thing in real time, such as a pipeline, aircraft, wind turbine, or turbine engine. Due to their low latency and high throughput for capturing almost real-time IoT data and supporting digital twins, 5G networks aid in its construction.

- **PUBLIC SAFETY**

Mission-critical video and data as well as mission-critical push-to-talk (MCPTT) are anticipated to advance with 5G.

- **FIXED WIRELESS**

In some areas, fixed wireless connections will provide a fixed line broadband option to ADSL, VDSL, Fibre Optic, and DOCSIS connections.

- **WIRELESS VIDEO TRANSMISSION FOR BROADCAST APPLICATIONS**

The prospect of employing local 5G networks in place of the SDI connections now used in broadcast camcorders has been explored by Sony. Based on FeMBMS, the 5G broadcast testing began in 2020 in the Orkneys, Bavaria, Austria, and Central Bohemia (Further evolved multimedia broadcast multicast service). The goal is to provide video (TV) and audio (radio) feeds to an infinite number of any data flow or even network authentication.

QUANTUM COMPUTING

WHAT IS QUANTUM COMPUTING?

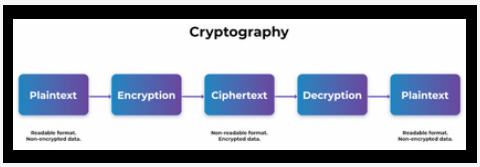
A fast developing technology called Quantum Computing uses the principles of quantum physics to solve issues that are too complicated for conventional computers. The true quantum hardware tools that scientists could only begin to envisage thirty years ago are now accessible to thousands of developers thanks to IBM Quantum. According to the most popular model of quantum computation, the computation is represented by a network of quantum logic gates. This concept is a sophisticated generalisation of Boolean circuits using linear algebra. There are various states that can exist in a memory made up of information bits. Thus, entries exist in a vector that represents all memory states (one for each state). The fact that the memory can be found in a specific state is represented by this vector, which can be thought of as a probability vector.

Efforts towards building a physical quantum computer focus on technologies such as transmons, ion traps and topological quantum computers, which aim to create high-quality qubits. These qubits may be designed differently, depending on the full quantum computer's computing model, as to whether quantum logic gates, quantum annealing, or adiabatic quantum computation are employed. There are currently a number of significant obstacles to constructing useful quantum computers. It is particularly difficult to maintain qubits' quantum states, as they suffer from quantum decoherence. Quantum computers therefore require error correction.

HISTORY

When scientist Paul Benioff proposed a quantum mechanical model of the Turing machine in 1980, quantum computing was born. A quantum computer might be able to simulate things that a classical computer isn't realistically capable of, according to Richard Feynman and Yuri Manin. An early version of the quantum circuit nomenclature was presented by Feynman in 1986. In 1994, Peter Shor created a quantum algorithm that may perhaps be used to decrypt communications that were encrypted with the RSA technique. Isaac Chuang, Neil Gershenfeld, and Mark Kubinec developed the first operational two-qubit quantum computer in 1998. Even while experiments have continued to advance since the late 1990s, most scientists still think that fault-tolerant quantum computing is still a long way off.

POTENTIAL APPLICATION



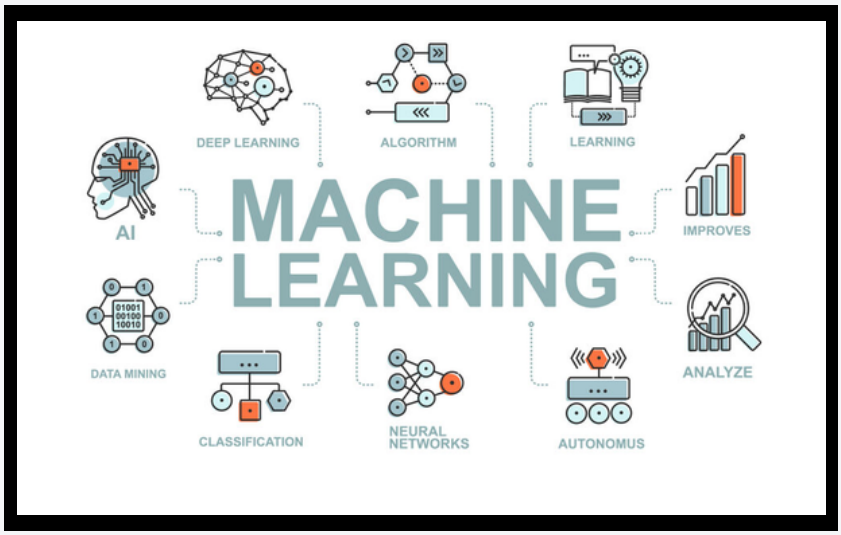
▪ CRYPTOGRAPHY

In order to secure and transmit data in a way that cannot be intercepted, quantum cryptography employs the inherent features of quantum physics. Data is encrypted and protected using cryptography so that only those with the proper secret key may decrypt it.

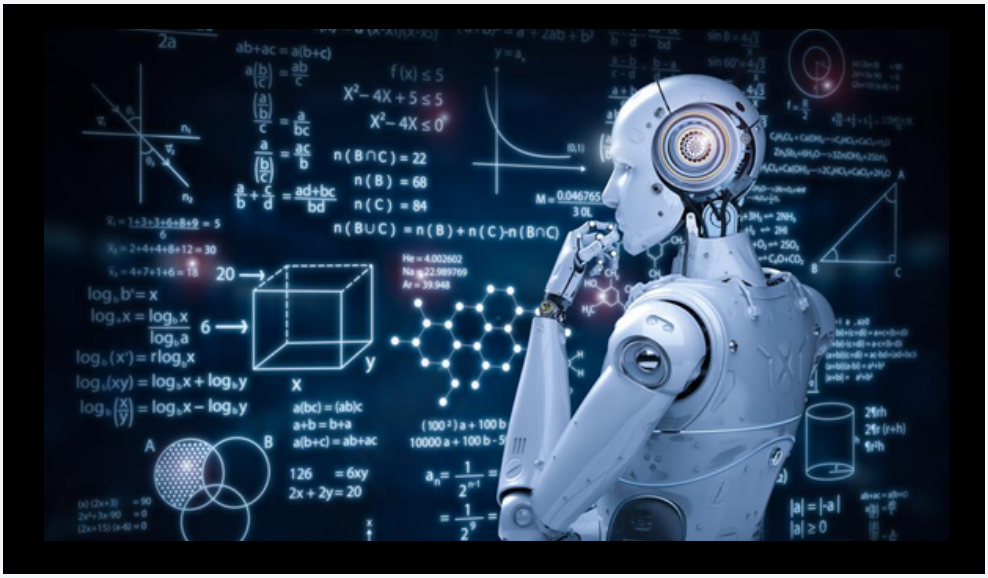
Cryptography is the study of secure communications techniques that allow only the sender and intended recipient of a message to view its contents. The term is derived from the Greek word *kryptos,* which means hidden. It is closely associated to encryption, which is the act of scrambling ordinary text into what's known as ciphertext and then back again upon arrival. In addition, cryptography also covers the obfuscation of information in images using techniques such as microdots or merging. Ancient Egyptians were known to use these methods in complex hieroglyphics, and Roman Emperor Julius Caesar is credited with using one of the first modern ciphers.

▪ MACHINE LEARNING

A subfield of artificial intelligence (AI) and computer science called machine learning focuses on using data and algorithms to simulate how humans learn, gradually increasing the accuracy of the system. For instance, a common and well-known use of machine learning in the real world is image recognition. Based on the intensity of the pixels in black-and-white or colour photos, it can recognise an object as a digital image. Examples of image recognition in the real world Indicate if an x-ray is malignant or not.



Machine Learning is the field of study that gives computers the capability to learn without being explicitly programmed. ML is one of the most exciting technologies that one would have ever come across. As it is evident from the name, it gives the computer that makes it more similar to humans: The ability to learn. Machine learning is actively being used today, perhaps in many more places than one would expect.



COMPUTATIONAL BIOLOGY

An interdisciplinary field known as computational biology and bioinformatics develops and uses computational techniques to analyse massive collections of biological data, such as genetic sequences, cell populations, or protein samples, in order to make new hypotheses or discover new biological processes. In order to comprehend biological systems and relationships, computational biology uses data analysis, mathematical modelling, and computer simulations. The area has roots in applied mathematics, chemistry, and genetics and is a nexus of computer science, biology, and big data.

Computational biology refers to the use of data analysis, mathematical modeling and computational simulations to understand biological systems and relationships.An intersection of computer science, biology, and big data, the field also has foundations in applied mathematics, chemistry, and genetics.It differs from biological computing, a subfield of computer engineering which uses bioengineering to build computers

Computational anatomy is the study of anatomical shape and form at the visible anatomical {\displaystyle 50-100\mu} scale of morphology. It involves the development of computational, mathematical and data-analytical modeling and simulating biological structures. It focuses on the anatomical structures being imaged, rather than the medical imaging devices. Due to the availability of dense 3D measurements via technologies such as magnetic resonance imaging, computational anatomy has emerged as a subfield of medical imaging and bioengineering for extracting anatomical coordinate systems at the morpheme scale in 3D.

THE EASY UPDATE FOR LIBRARY FOR YOUR PROJECT

INTRODUCTION

Applications that do not automatically update irritate me. Really, This library will perform every task for you automatically. All you need to save the updates is a web server that can execute PHP.

FEATURES

- Full or differential updates
- Silent update
- Compression per item
- Detached databases

WINDOWS APPLICATION

- Include tu.hpp
- Instantiate a TU::TU object:

C++

```
TU(const char* prjg,const wchar_t* host,const wchar_t* path,
bool SSL = false,unsigned short Port = 0,DWORD flg = 0,const wchar_t* un = 0,
const wchar_t* pwd = 0,const wchar_t* uploadpwd = 0)
```

PARAMETERS

- The unique project GUID created by tu.php admin panel
- The hostname
- The path to the PHP script
- true/false for SSL
- Optional port (if 0, 80 or 443 are used)
- Flags for InternetConnect() function
- Optional username/password for your server
- The upload password if you plan to upload files

C++
HRESULT Upload

(std::function<HRESULT(size_t sent, size_ttotal, void*)> func =nullptr,void* lp = 0);
HRESULT hr = tu.Upload();
C++

vector<tuple<wstring, string>> tux; auto a = L"m.docx";
tux.emplace_back(make_tuple<wstring,

string>(forward<wstring>(a),string("A44BC1B3-D919-4835-A7D8-FC633EB7B7EC")));
auto b = L"m.pdf";
tux.emplace_back(make_tuple<wstring,

string>(forward<wstring>(b),string("A44BC1B3-D919-4835-A7D8-FC633EB7B7ED")));
tu.AddFiles(tux);

There isalso AddSelf() to add your own executable automatically.
Uploading Updates to Your Server

The PHP script is communicated with using my lovely REST library, and the zip file containing the uploaded data is created using ZipUtils. Since this method requires the upload password and you don't want anyone to discover it by sniffing the connection, you normally won't be calling it from your app. Typically, an independent "uploader" will be used. All of the items are compressed into a ZIP file and sent to tu.php by the function. A sample "uploader" that uploads objects from an XML setup may be found in the github repository. The callback, which is optional, is called repeatedly while your files are uploading by the function. It must return E FAIL in order to halt the upload

- ## CHECKING FOR UPDATES

C++

HRESULT Check();

HRESULT hr = tu.Check();

ReturnsS_OK if all the checked files are up to date, or S_FALSE if any of the files need updating.
Updating

C++

HRESULT DownloadFull(std::function<HRESULT

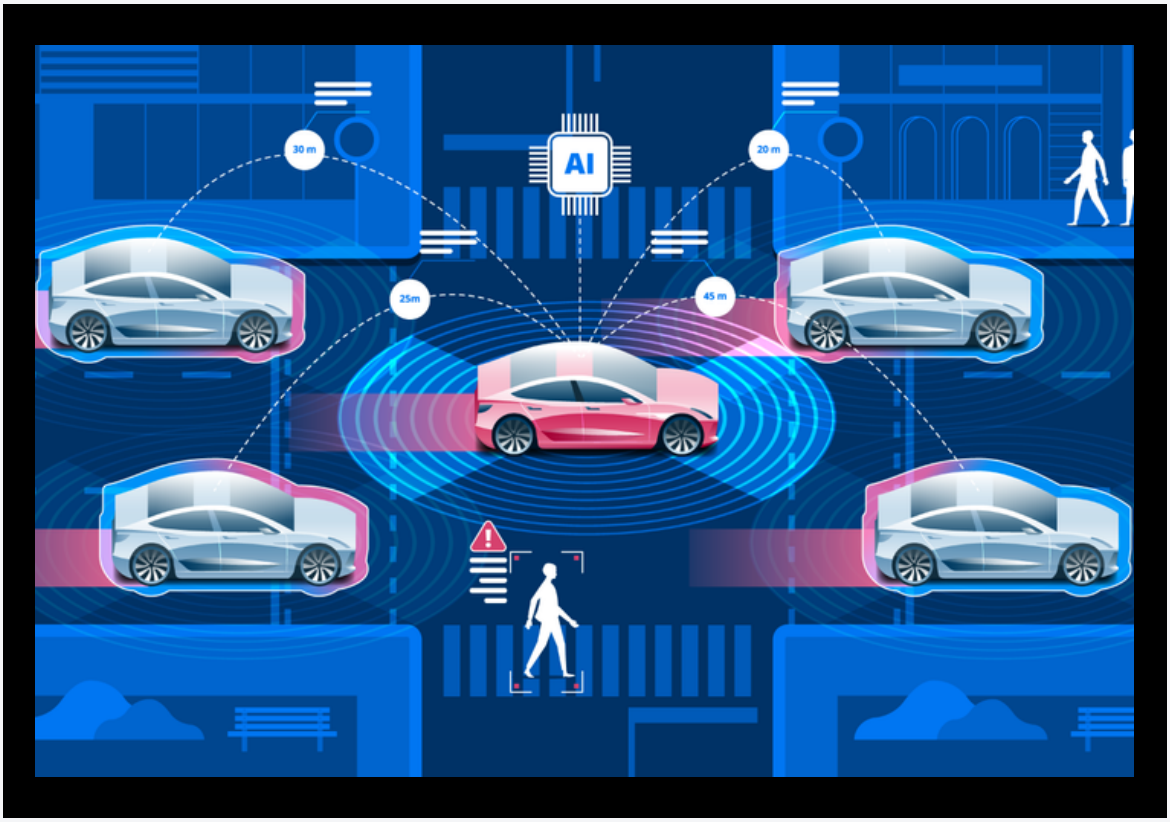
(unsigned long long, unsigned long long, void*)> func = nullptr, void* lp = 0);

Automatically downloads all the files that need download and updates them. This function works also with files in use (such as your own application), by moving the current file into a .OLD one, creating a new target, then marking the OLD file for removal. This way, you can self-update easily with a few lines of code and your users won't ever notice it: The next time the application starts, the update will be there.

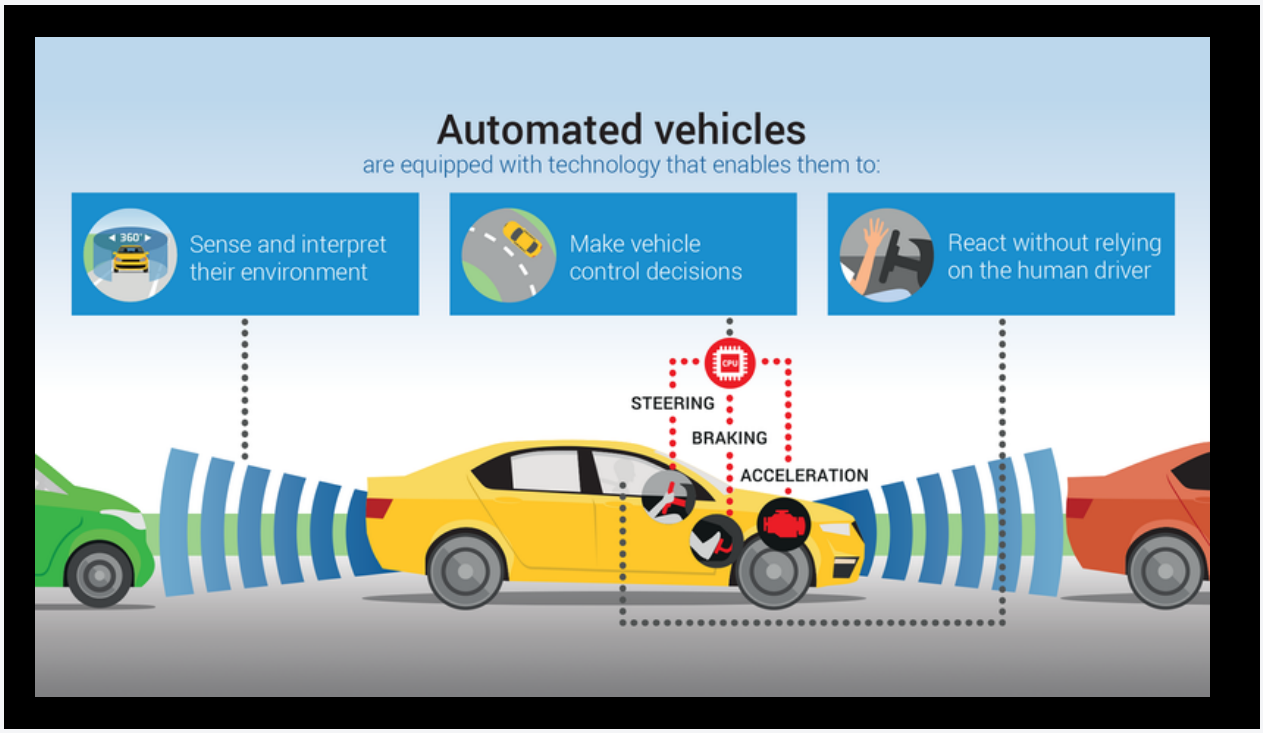
AUTONOMOUS DRIVING

WHAT IS AUTONOMOUS DRIVING?

Typically, the term "autonomous driving" refers to self-driving cars or other transportation systems that operate without the assistance of a human driver. The J3016 standard was released by SAE International (Society of Automotive Engineers) in 2014 to outline the various stages of development leading up to fully autonomous cars. Level 0 (no automation) and Level 5 are the different levels of autonomous driving (full vehicle autonomy).

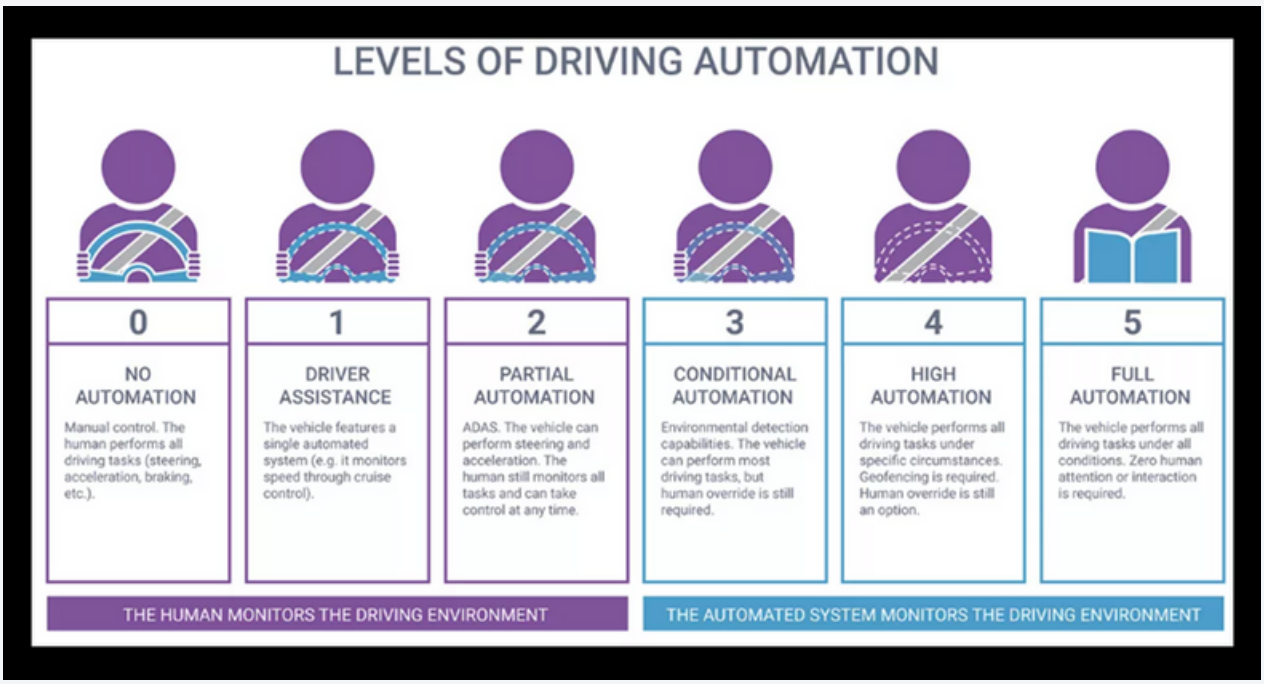


Vehicle automation is already a reality on today's vehicles with increasing use of **Advanced Driver Assistance Systems** (ADAS) and partially automated functions. Further evolution of these systems is being driven by the need for safety improvements and by customer expectations for even greater ADAS functionalities. **Stellantis is committed to the continued development of autonomous driving technologies** which will pave the way for the mobility of the future, leveraging on both its internal capabilities and decisive partnerships with tech leaders.



Sophisticated software then processes all this sensory input, plots a path, and sends instructions to the car's actuators, which control acceleration, braking, and steering. Hard-coded rules, obstacle avoidance algorithms, predictive modeling, and object recognition help the software follow traffic rules and navigate obstacles.

- **LEVELS IN AUTONOMOUS DRIVING**
  - There are 0 to 5 levels of Autonomous Driving .Totally 6 levels.
  - Let us see that in following.



- **LEVEL 0 (NO DRIVING AUTOMATION)**

Today's majority of cars are Level 0: manually operated. Despite the possibility of assistance devices, the "dynamic driving duty" is performed by the driver. The emergency braking system is one such instance; as it doesn't "drive" the car, it is not considered to be automated

- **LEVEL 1 (DRIVER ASSISTANCE)**

The lowest level of automation is at this point. The car has a single autonomous driving aid system that can steer or accelerate (cruise control). Because the human driver oversees the other aspects of driving, such as steering and braking, adaptive cruise control, which allows the automobile to be kept at a safe distance behind the car in front of it, is classified as Level 1.

- **LEVEL 2 (PARTIAL DRIVING AUTOMATION)**

This refers to ADAS, or advanced driver assistance systems. The car has steering and acceleration/deceleration controls. Because a human is seated in the driver's seat and has the ability to take over the vehicle at any time, this automation falls short of self-driving in this instance. Level 2 systems include Cadillac (General Motors) Super Cruise and Tesla Autopilot.

- **LEVEL 3 (CONDITIONAL DRIVING AUTOMATION)**

From a technology standpoint, the change from Level 2 to Level 3 is significant, yet from a human perspective it is minor, if not non-existent. Level 3 vehicles have the ability to "sense the surroundings" and can take judgments by themselves, like as accelerating past a stationary object. However, they still need human override. If the system is unable to complete the task, the driver must be awake and be prepared to take over.

- **LEVEL 4 (HIGH DRIVING AUTOMATION)**

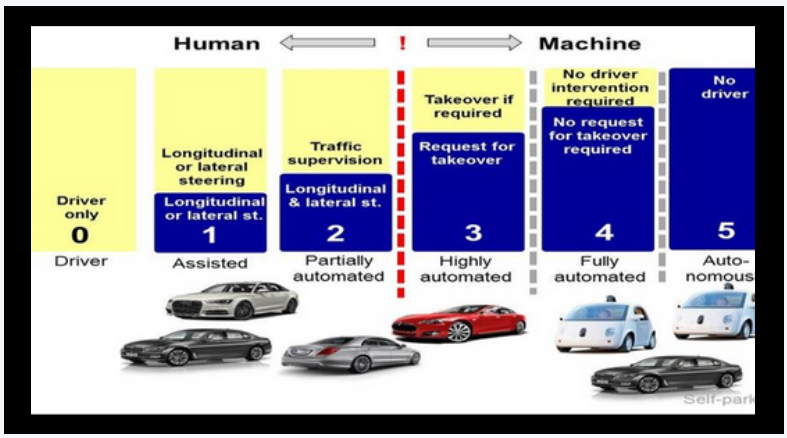
The main distinction between Level 3 and Level 4 automation is the ability of Level 4 vehicles to step in when something goes wrong or a system fails. In this way, these cars typically don't need to interact with people. An individual can still manually overrule, though. Vehicles at Level 4 are capable of operating autonomously. But they can only do it in a small area while laws and infrastructure remain the same (usually an urban environment where top speeds reach an average of 30mph). It's called geofencing. Because of this, the majority of Level 4 vehicles in use are designed for ridesharing.

- **LEVEL 5 (FULL DRIVING AUTOMATION)**

With Level 5 cars, the "dynamic driving task" is no longer necessary. Level 5 vehicles won't even have pedals for accelerating or braking or steering wheels. They will be unrestricted by geofencing, able to travel anywhere, and capable of carrying out any task that a skilled human driver can. Several regions of the world are testing fully autonomous vehicles, but none are presently accessible to the general public.

ADVANTAGES OF AUTONOMOUS VEHICLES

1. **Reduced Accidents.**
2. **Reduced Traffic Congestion.**
3. **Reduced CO2 Emission.**
4. **Increased Lane Capacity.**
5. **Lower Fuel Consumption.**
6. **Reduced Travel Time and Transportation Costs.**
7. **More Effective and Affordable Taxis.**
8. **More Efficient Parking.**
9. **Last Mile Services.**
10. **Transportation Accessibility.**

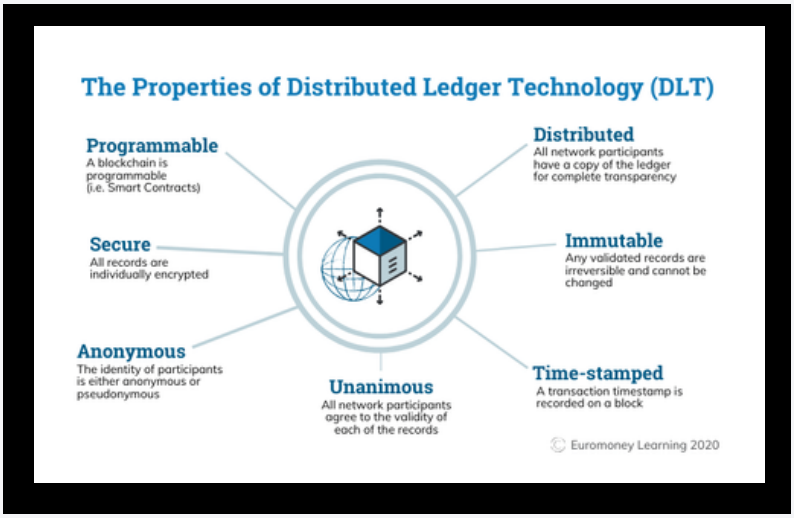


Autonomous vehicle technology may be able to provide certain advantages compared to human-driven vehicles. One such potential advantage is that they could provide increased safety on the road – vehicle crashes cause many deaths every year, and automated vehicles could potentially decrease the number of casualties as the software used in them is likely to make fewer errors in comparison to humans. A decrease in the number of accidents could also reduce traffic congestion, which is a further potential advantage posed by autonomous vehicles. Autonomous driving can also achieve this by the removal of human behaviours that cause blockages on the road, specifically stop-and-go traffic.

BLOCKCHAIN TECHNOLOGY

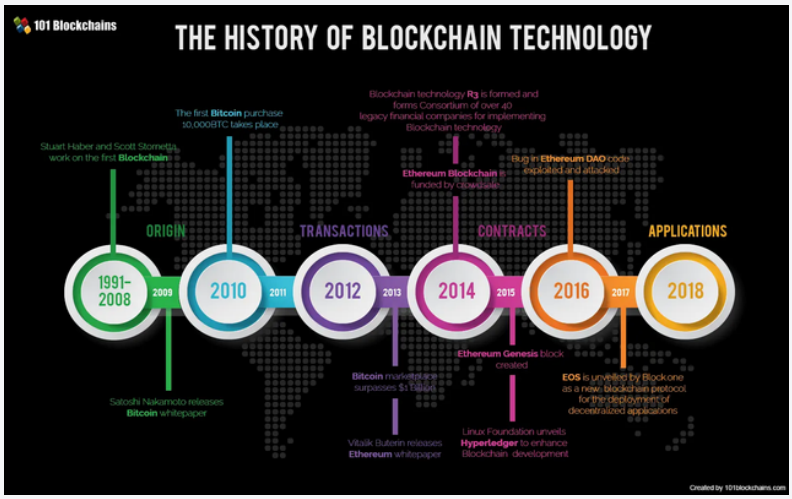
A chain of blocks containing information is what is meant by the term "blockchain." The method aims to timestamp digital documents so that it is impossible to modify or backdate them. Blockchain was created to address the issue of duplicate records without the use of a central server

Blockchain technology is an advanced database mechanism that allows transparent information sharing within a business network. A blockchain database stores data in blocks that are linked together in a chain. The data is chronologically consistent because you cannot delete or modify the chain without consensus from the network. As a result, you can use blockchain technology to create an unalterable or immutable ledger for tracking orders, payments, accounts, and other transactions. The system has built-in mechanisms that prevent unauthorized transaction entries and create consistency in the shared view of these transactions.



HISTORY

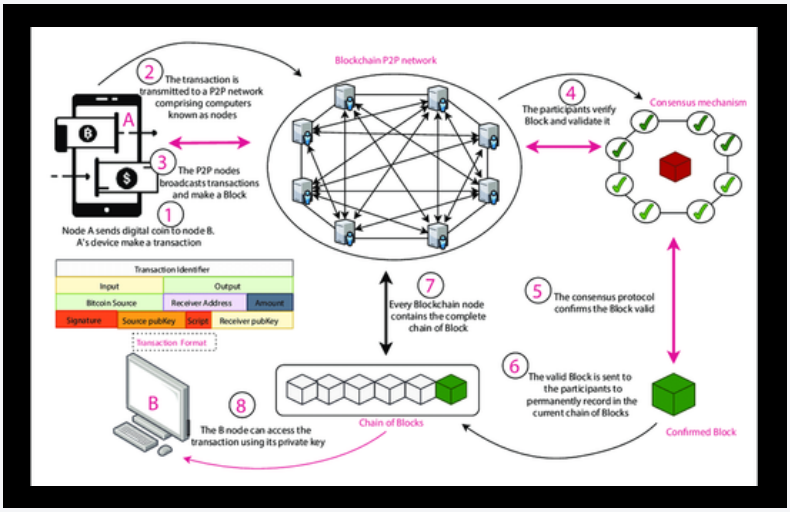
A blockchain-like system was first proposed by cryptographer David Chaum in his dissertation "Computer Systems Established, Maintained, and Trusted by Mutually Suspicious Groups" from 1982. The size of the Bitcoin blockchain file, which contains a history of every transaction that has ever taken place on the network, hit 20 GB in August 2014. (gigabytes). The size of the bitcoin blockchain increased from roughly 30 GB in January 2015 to 50 GB and 100 GB in January 2016 to 2017. By the start of 2020, the ledger size had surpassed 200 GB. In Satoshi Nakamoto's initial paper, the phrases "block" and "chain" were used independently, but by 2016, the term "blockchain" had gained popularity. As of 2021, there were 65 million Blockchain.com wallets and 31 million users. Since 2012, 28% of all bit coin transactions have been sent or received through a Blockchain.com wallet. Investors including Moore Strategic Ventures, Kyle Bass, Access Industries, Rovida Advisors, Light speed Venture Partners, GV, Lakestar, and Eldridge contributed $120 million to Blockchain.com's financing round in February 2021. The business had raised $190 million in total, including earlier rounds of venture capital funding. The business revealed a new $300 million fundraising round a month later. Investment company Baillie Gifford contributed $100 million to one third of the funds raised. The company's valuation at the fundraising round was $5.2 billion.



In **1992**, Merkle Trees were incorporated into the design, which makes blockchain more efficient by allowing several documents to be collected into one block. **Merkle Trees** are used to create a 'secured chain of blocks.' It stored a series of data records, and each data records connected to the one before it. The newest record in this chain contains the history of the entire chain. However, this technology went unused, and the patent lapsed in 2004.

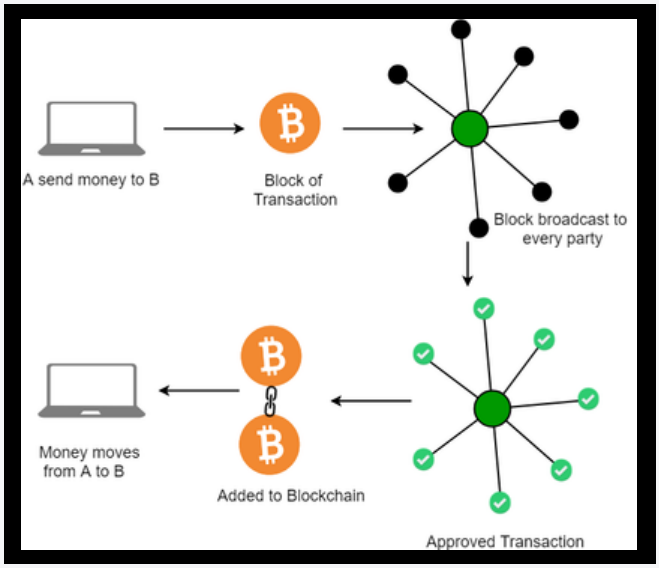
BLOCK CHAIN FORMATION

- A blockchain was created by a person (or group of people) using the name (or pseudonym) Satoshi Nakamoto in 2008 to serve as the public distributed ledger for bitcoin crypto currency transactions, based on previous work by Stuart Haber, W. Scott Stornetta, and Dave Bayer.
- Miners create new blocks on the chain through a process called mining. In a blockchain every block has its own unique nonce and hash, but also references the hash of the previous block in the chain, so mining a block isn't easy, especially on large chains.

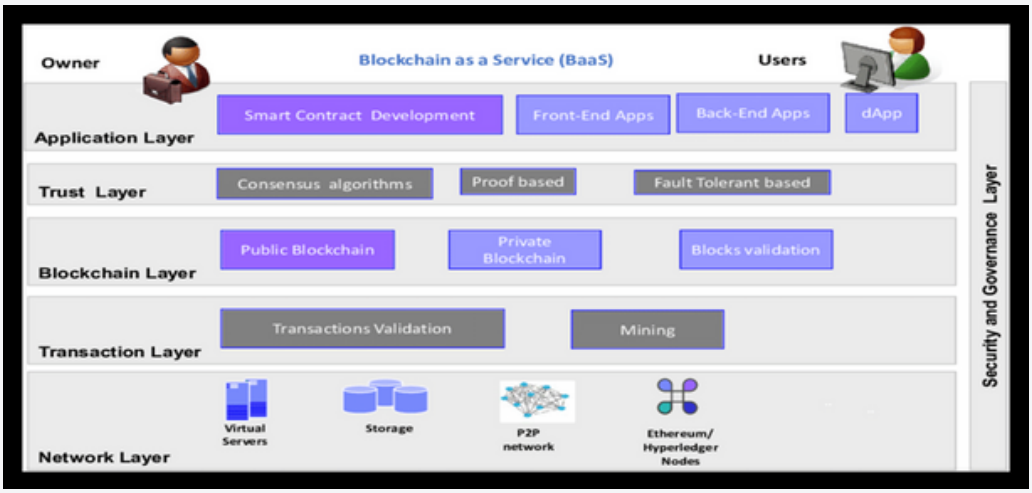


STRUCTURE & DESIGN

A blockchain is a decentralized, distributed, and often public, digital ledger consisting of records called blocks that are used to record transactions across many computers so that any involved block cannot be altered retroactively, without the alteration of all subsequent blocks.This allows the participants to verify and audit transactions independently and relatively inexpensively.A blockchain database is managed autonomously using a peer-to-peer network and a distributed timestamping server. They are authenticated by mass collaboration powered by collective self-interests.Such a design facilitates robust workflow where participants' uncertainty regarding data security is marginal. The use of a blockchain removes the characteristic of infinite reproducibility from a digital asset. It confirms that each unit of value was transferred only once, solving the long-standing problem of double-spending. A blockchain has been described as a value-exchange protocol.A blockchain can maintain title rights because, when properly set up to detail the exchange agreement, it provides a record that compels offer and acceptance.



- **LOGICALLY, A BLOCKCHAIN CAN BE SEEN AS CONSISTING OF SEVERAL LAYERS**
  - Infrastructure (hardware)
  - Networking (node discovery, information propagation[26] and verification)
  - Consensus (proof of work, proof of stake)
  - Data (blocks, transactions)
  - Application (smart contracts/decentralized applications, if applicable)



Networking (node discovery, information propagation and verification)

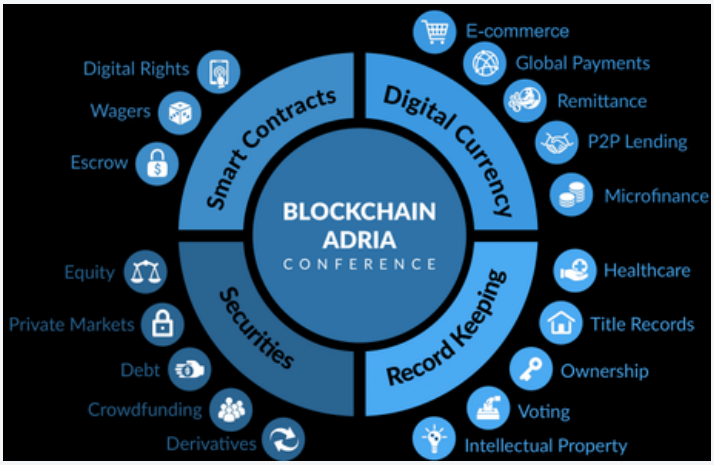
There are five layers in networking layer. They are

1. Hardware infrastructure layer,
2. Data layer,
3. Network layer,
4. Consensus layer,
5. Application layer.

USES

The integration of blockchain technology is possible in many fields. The main function of blockchains is to serve as a distributed ledger for crypto currencies like bit coin; by the end of 2016, a few other operational products have also advanced past the stage of proof of concept. In order to assess the impact of blockchain technology on organisational efficiency in their back office, some firms began testing the technology in 2016.

The biggest use case of blockchain technology so far is cryptocurrencies. However, blockchain does not end there – banks and financial institutions are finding blockchain helpful because it helps them process transactions more quickly and at a lesser cost.



According to estimates, $2.9 billion was spent in blockchain technology in 2019, an increase of 89% from the previous year. Furthermore, the International Data Corp predicted that by 2022, corporate spending on blockchain technology will total $12.4 billion. Furthermore, The second-largest professional services network in the world, PricewaterhouseCoopers (PwC), estimates that by 2030, blockchain technology will have the ability to produce more than $3 trillion in annual economic value. In 2018, PwC did a study in which they polled 600 business leaders and found that 84% of them had at least some exposure to using blockchain technology. This indicates a substantial demand and interest in blockchain technology, which further supports PwC's estimate. Since 2016, personal use of blockchain technology has also significantly increased. In contrast to the about 10 million blockchain wallets in 2016, there were more than 40 million in 2020, according to statistics. In sustainable management using blockchain technology.

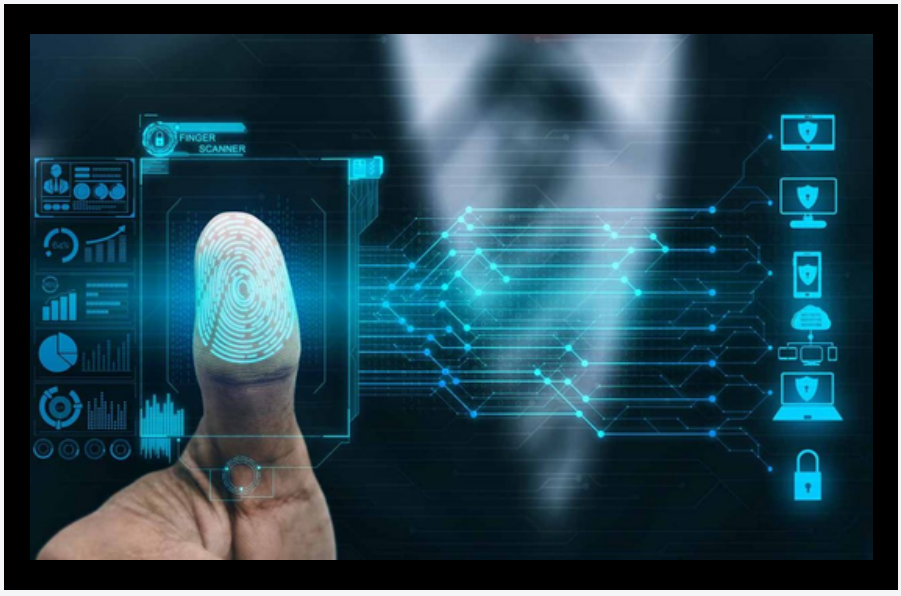
BIOMETRICS

WHAT IS A BIOMETRIC MEANING?

- Biometrics refers to distinctive physical traits that may be recognised automatically, like fingerprints.
- Biometrics is the measurement and analysis of bodily parameters in relation to human traits. In computer science, biometric authentication is used for access control and identification. It is also used to locate people in groups that are being watched.
- The distinct, quantifiable traits that are used to identify and categorise people are called biometric identifiers. Physiological traits that relate to body shape are frequently classed as biometric identifiers.

BIOMETRIC FUNCTIONALITY

Human physiology and chemistry can be used for a variety of biometric authentication purposes. A number of factors are weighted when choosing a biometric to employ in a certain application. When determining whether a feature is appropriate for use in biometric authentication, Jain et al. (1999) suggested seven such factors to be taken into consideration..



- ## USE OF MULTI-BIOMETRIC IDENTIFICATION ADDS A FURTHER LEVEL OF SECURITY

Our fingerprints were the first biometrics commonly utilised for identity verification since they are the only type of biometric that leaves a visible trace. Other biometrics are now widely utilised as well, including DNA, iris, and face. Solutions that allow dual biometric identification will become more prevalent in 2020. Different levels of security may be required depending on the type of transaction or engagement. Since using our face or fingerprint to unlock a smartphone is a comparatively less sensitive action, we can already do this. In contrast, mobile biometric devices that recognise faces and fingerprints have been created for law enforcement agencies, allowing officers to confirm people's identities while on patrol. The national eID card of Nepal is an additional illustration. Because Nepalese citizens can communicate with their banks via their ID cards, the card has iris and fingerprint data incorporated for maximum security. In 2020, this trend will intensify.

- ## WHAT IS A FINGERPRINT SCANNER AND HOW IT WORKS?

A capacitive fingerprint sensor works by discharging energy only where your fingertip ridges hit a grid of small capacitors. The fingerprint pattern can then be mapped using an array of thousands of capacitors. These sensors can occasionally handle swipes or force sensing as well.

- **WIDE-SPREAD ADOPTION OF FACIAL RECOGNITION TECHNOLOGY**

With such excellent performance levels in terms of speed and accuracy, it is not surprising that facial recognition technology will be widely used in 2020. Numerous use cases from the past few years have already shown how this technology enhances ease and security. Due to the little amount of behavioural modification required, it is one of the least invasive biometric identification techniques.

- **WHAT IS A RETINAL SCANNER AND HOW IT WORKS?**

An image of a person's retinal blood vessel pattern is used as a biometric verification tool called retina scanning to grant access to secure installations.The foundation of biometric verification technology is how individuals can be individually identified by one or more distinctive biological features. Fingerprints, hand geometry, earlobe geometry, retina and iris patterns, voice waves, DNA, and signatures are examples of distinctive identifiers.

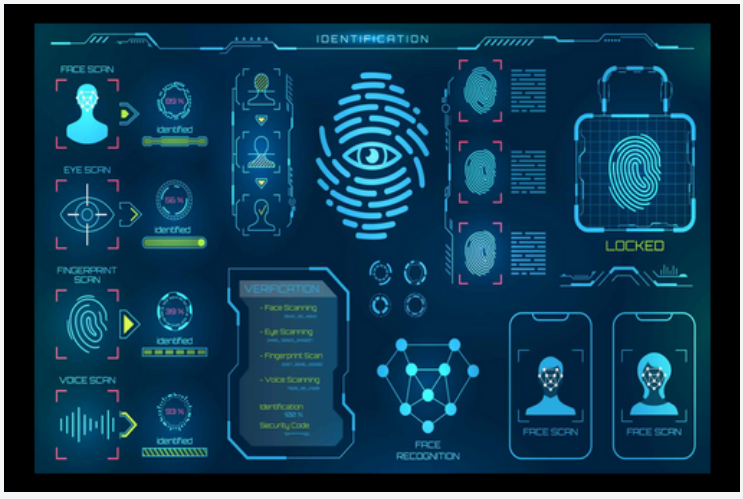
- **WHAT IS A VOICE BIOMETRIC AND HOW IT WORKS?**

o Voice biometric systems function by identifying the traits that set a person's speech apart from that of others. As a result, a "voiceprint" that resembles a fingerprint is created. A "voice template" is another name for a voiceprint.

o It utilises voice recognition on two different levels. The first recognises each word that is entered. These systems currently offer accuracy rates of more than 90% as a result of years of development. Voice biometrics technologies also enable caller identification.

- **WHAT ARE THE ADVANTAGES OF BIOMETRIC AUTHENTICATION?**

You can implement a secure access model and take advantage of improved security by using the technologies outlined above. The advantages of using this sort of authentication for your secure data and regions are presumably already clear to you. The following are some benefits of using biometric authentication, such as a fingerprint scanner.



1.Imporved security,
2.Higher accuracy
3.Faster access,
4.Greater convenience

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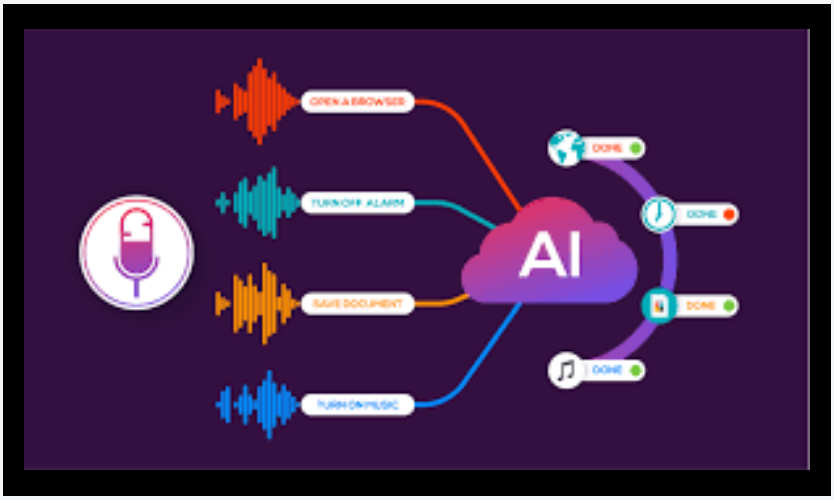
VOICE TECHNOLOGY

WHAT IS MEANT BY VOICE TECHNOLOGY

o A system that enables a computer to distinguish between several spoken words. The two essential components of the process are the actual phonetic identification of various words and the creation or interpretation of the spoken language, a process known as natural language processing.

o Voice recognition enables consumers to multitask by speaking directly to their Google Home, Amazon Alexa or other voice recognition technology. By using machine learning and sophisticated algorithms, voice recognition technology can quickly turn your spoken work into written text.



HOW VOICE RECOGNITION WORKS?

o The analogy-to-digital conversion process, used by voice recognition software on computers, converts analogue audio into digital signals. A computer needs a digital vocabulary or database of words or syllables, as well as a quick way to compare this information to signals, in order to decode signals. When the software is executed, the speech patterns are put into memory from storage on the hard drive. Pattern recognition is the process of comparing these saved patterns to the output of the A/D converter using a comparator.

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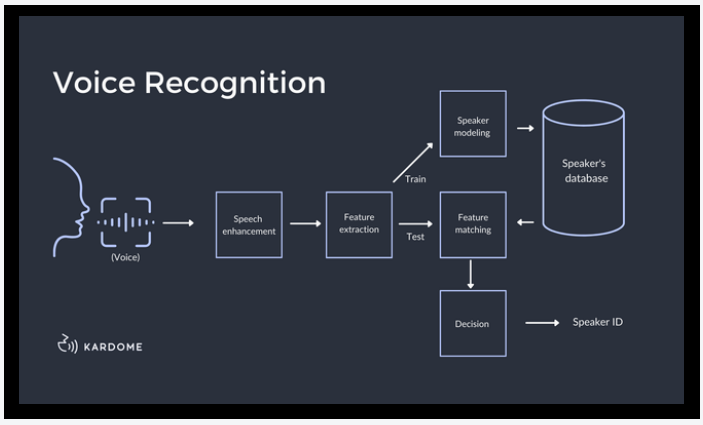
o Technology that allows a computer to recognize different spoken words. The process can be divided into two main parts: the actual phonetic recognition of different words, and the construction of or interpretation of the actual language as spoken, a field called natural language processing.

o Speech recognition software works by segmenting the audio of a speech recording into individual sounds, analysing each sound, and then transcribing those sounds into text using algorithms to discover the most likely words that fit in that language

HISTORY

o Speaker independence was seen as a significant advancement by the early 2010s, when speaker independence was clearly distinguished from speech recognition, also known as voice recognition. Systems up until that point required a "training" phase. "Finally, the doll that knows you," read the tagline of a doll advertisement from 1987. Although it was stated that children could "teach it to listen to their voice.

o In 2017, Microsoft researchers reached a historical human parity milestone of transcribing conversational telephony speech on the widely benchmarked Switchboard task. Multiple deep learning models were used to optimize speech recognition accuracy. The speech recognition word error rate was reported to be as low as 4 professional human transcribes working together on the same benchmark, which was funded by IBM Watson speech team on the same task.



APPLICATIONS

- ## IN-CAR SYSTEMS

The voice recognition system is typically activated by a manual contr ol input, such as a finger control on the steering wheel, and the driver is informed of this via an auditory prompt.

The system features a "listening window" after the audio prompt during which it can accept a speech input for recognition. Simple voice commands can be used to answer calls, choose radio stations, or play music from an MP3 player, flash drive, or compatible smartphone.In place of a predetermined set of commands, some of the newest automobile models include natural-language speech recognition, enabling the driver to speak in entire sentences and everyday expressions.With such systems there is, therefore, no need for the user to memorize a set of fixed command words.

Voice assistants in the car have enormous potential. But they offer even more potential for sales. Retailers get another channel to interact with customers, get to make purchase on the road, just the voice commands.

- ## ADAVNTAGES OF VOICE ASSISTANTS SYSTEM IN CAR

  - In-car speech recognition systems aim to remove the distraction of looking down at your mobile phone while you drive. Instead, a heads-up display allows drivers to keep their eyes on the road and their mind on safety.
  - About 125 million U.S. drivers use voice control technology in cars today. As the capabilities of in-car voice systems expand, we can expect more users to take advantage.
  - Voice Control makes the operation of in-vehicle equipment possible by using voice commands.

- **IN HEALTH CARE**

Healthcare technology refers to any IT tools or software designed to boost hospital and administrative productivity, give new insights into medicines and treatments, or improves the overall quality of healthcare provided.

  - **TRENDS IN MEDICAL TECHNOLOGY THAT CAN BENEFIT PRACTITIONERS**

    - **VIRTUAL SCRIBING**

Although Alexa may dominate the personal digital assistant market, the medical industry is testing comparable technology to save time and make doctors' jobs easier.

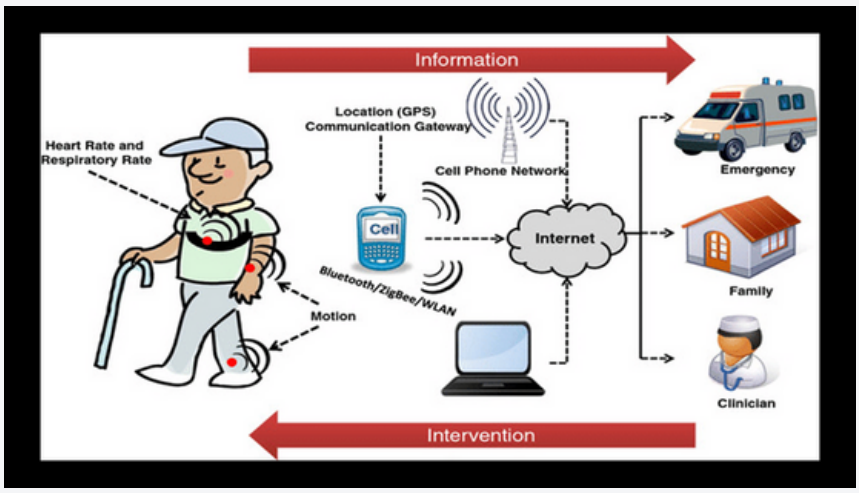
- **EMBRACING CHABOT'S**

According to Greg Kefer with Life Link, automated chats with catboats that send text messages to patients in response to their requests and with information lessen interruptions. Bots act as virtual concierges in 28 emergency rooms at Banner Health, giving patients information on when lab results are anticipated and what to do next.

- **SHIFTING TO VIRTUAL CARE**
  - A 2019 Accenture survey found that millennials and Gen Zers are particularly fond of virtual healthcare consultations. Nearly 29% of survey participants reported using virtual care.
  - The convenience of being able to treat patients remotely helps both the clinician and the patient. It gives doctors more flexibility. Patients can be "seen" at home, saving travel time. Physicians can log in and receive virtual visits from some companies whenever they're available.

- **COMMUNICATING TO REDUCE NO-SHOWS**
  - Patient no-shows result in subpar results, missing chances to achieve value-based care and patient satisfaction goals, and cost $150 billion annually.
  - The secret to efficiency is technology that goes beyond text-only reminders. A platform that connects with the EHR to offer real-time, straightforward patient communication and scheduling, syncs with office appointment systems, and enables automatic outreach and follow-up when appointments are missed is what clinicians want and need

- **MONITORING PATIENTS' WEARABLE’**
  - Patients are producing a lot of data on wearables, including Fit Bits and Apple Watches, and by 2026, use of wearable is expected to rise by almost 25%, according to Fortune Business Insights.
  - There will be a tonne of data to sort through as a result of some wearable gadgets sending information to the user's doctor. On the plus side, wearable data gives clinicians knowledge about patients' health outside of the office, at their place of employment or at home.
  - Staff Care is always looking for new ways to better serve locum tenens workers and the facilities they work in..



- **MOVING TO THE CLOUD**

According to Select Hub, technology advancements in medicine include shifting data and record systems to the cloud to cut expenses and handle resource limitations. Medical professionals can easily access a lot of data thanks to cloud-based technology. Furthermore, cloud-based service providers now provide stronger security than in the past.

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