**Review Paper**

***Data Mining***

# Data Mining

* Data mining is the process of transferring a large amount of data held in repositories and using pattern recognition technologies such as statistical and mathematical methodologies to identify meaningful new connections, patterns, and trends.
* It is the study of factual datasets in order to uncover previously unknown linkages and summaries the data in unique ways that are both logical and beneficial to the data owner. It is the process of selecting, exploring, and modelling large amounts of data in order to discover previously unknown regularities or relationships in order to generate clear and valuable findings for the database owner.
* Data Mining and Data Science are two terms that are often used interchangeably. The main task is to evaluate the data in order to extract critical information that may be used to solve a problem or advance the firm.

Data mining is also known as **Knowledge Discovery in Database (KDD)**. Knowledge discovery as a process includes an iterative series of the following steps −

* **Data Cleaning:** It can clean up data by removing noise and inconsistencies.
* **Data integration:** It refers to the process of connecting many data sources.
* **Data selection:** It is the process of retrieving data from a database that is relevant to the analysis purpose.
* **Data transformation:** It is the process of transforming or linking data into forms that may be mined by using summary or aggregate processes.
* **Data mining:** It is a crucial stage in the process of extracting data patterns using intelligent approaches.
* **Pattern Evaluation:** It can recognize the truly important patterns describing knowledge based on certain intriguing measures in pattern evaluation.
* **Knowledge presentation:** It is the process of presenting mined knowledge to a client using visualization and knowledge representation techniques.

# History of Data Mining

* Data mining, information extraction, data discovery, data harvesting, data archaeology, and data pattern processing are some of the terms used to describe the process of uncovering meaningful patterns in data. Data mining is a specific stage in the KDD process, which defines the entire process of discovering meaningful information from data.
* Data mining is the process of extracting patterns from data using certain algorithms. A major aspect of this object is the distinction between the KDD process and the data-mining step (inside the process).
* Data preparation, data selection, data cleaning, incorporation of relevant prior knowledge, and effective analysis of mining findings are all key aspects in the KDD process to ensure that valuable knowledge is extracted from the data. Data mining (also known as data dredging in the statistical literature) can be a harmful activity because it can quickly lead to the discovery of meaningless and flawed designs.

# Task of Data Mining

* The collection of task-relevant data to be mined identifies the areas of the database or set of information that the user is interested in.
* The type of data mining functions to be used, such as characterization, discrimination, association or correlation analysis, classification, prediction, clustering, outlier analysis, or evolution analysis, are all defined by the type of knowledge to be mined.
* Concept hierarchies are a well-known type of background knowledge that allows data to be mined using a variety of abstraction strategies. Various sorts of knowledge can be measured in a variety of ways.
* These primitives can be incorporated into a data mining query language, allowing users to connect to data mining systems with greater flexibility. A query language for data mining provides a foundation on which user-friendly graphical interfaces can be built.
* Data mining includes a large range of functions, from data characterization to evolution analysis, therefore creating an inclusive data mining language is difficult.

# Features of Data Mining

* **Data types** − Most industry-available data mining systems deal with structured, record-based, relational-like data with statistical, category, and symbolic properties. Because some types of data or applications require specific algorithms to search for patterns cannot meet their needs. Specialized data mining systems, which mine text reports, geographical data, biological data, or Web data, or are dedicated to certain applications, can be employed instead
* **System issues** − A data mining system can run on a single operating framework or many operating frameworks. UNIX/Linux and Microsoft Windows are two well-known operating systems for hosting data mining software. There are other data mining solutions for Macintosh, OS/2, and other platforms.
* **Data sources** - The data sources identify the precise data formats that the data mining system will work with. Some systems exclusively deal with ASCII text files, whereas others work with relational data, such as data warehouse data, and can access several relational data sources.
* **Data Mining Functions and Methodologies** - Data mining systems that offer various data mining functions and methodologies per function give the user more freedom and power in their study. Some difficulties may need users trying a few different mining routines or combining several, and some approaches may be more efficient for particular types of data than others.

# What are the challenges in Data Mining?

* **Efficiency and scalability of data mining algorithms** *−* It can successfully extract data from enormous amounts of data in databases, and the knowledge discovery methods should be fast and scalable to big databases. In particular, a data mining algorithm's execution time should be predictable and reasonable in large datasets.
* **Usefulness, certainty, and expressiveness of data mining results** *−*The recognized knowledge should accurately reflect the database's contents and be useful for certain applications. Measures of uncertainty, in the form of approximate or quantitative criteria, must be used to quantify the imperfection.
* **Interactive mining knowledge at multiple abstraction levels** − Because predicting what may be discovered from a database is difficult, a high-level data mining query should be viewed as a probe that can provide some intriguing traces for further investigation.
* **Expression of various kinds of data mining results** − A large volume of data may be used to uncover many types of information. It may also choose to study newly obtained knowledge from several perspectives and provide it in various formats.
* **Mining information from different sources of data** − The Internet, for example, is a widely available local and wide-area computer network that can connect multiple sources of data and construct massive dispersed, heterogeneous databases.

# Applications of Data Mining

* **Data warehouses and data preprocessing** − Data warehouses are necessary for data mining and information exchange. However, in the field of geospatial data, there is currently no real geographic data warehouse. It may be necessary to identify ways to resolve spatial and temporal data incompatibilities, such as reconciling semantics, accuracy, and precision, in order to build such a warehouse.
* **Mining complex data types** − Scientific data sets are often diverse, containing semi-structured and unstructured data, as well as multimedia and geo-referenced stream data. For processing spatiotemporal data, linked idea hierarchies, and complicated spatial linkages, robust approaches are required.
* **Graph-based mining** − Due to the limits of present modelling methodologies, it is sometimes difficult or impossible to simulate a variety of physical events and processes. Labeled graphs can also be utilized to overcome some of the geographical and other relationship properties that can be found in numerical data sets.
* **Visualization tools and domain-specific knowledge** − Numerical data mining systems require high-level graphical user interfaces and visualization tools. These must be integrated with current domain-specific data systems and database systems to help researchers and general users find designs, understand and visualize them, and use what they've learned in their decision-making.

**Web Mining**

## Web Mining

* Web mining is the practice of obtaining information directly from the Web using data mining techniques and algorithms, such as Web documents and services, Web content, hyperlinks, and server logs. Web mining's purpose is to find patterns in Web data by collecting and analyzing data to acquire insight into trends, the industry, and people in general.

## Categories of Web Mining

* **Web content mining -** This is the process of extracting usable information from the text, photos, and audio/video assets that make up most Web pages and documents. Natural language processing (NLP) and information retrieval techniques are widely employed in this subject. It has the potential to give useful and fascinating patterns regarding user requirements. Text mining, machine learning, and natural language processing are all connected to text documents. Text mining is another name for this type of mining. According to the content of the input, this sort of mining scans and mines text, pictures, and groups of web pages.
* **Web** **structure mining** - This is the technique of using graph theory to analyze the nodes and connection structure of a website. This yields two results: the structure of a website in terms of how it is linked to other websites, and the document structure of the website itself, in terms of how each page is linked. It establishes a link between web sites that are linked by information or a direct link. Web structure mining may be quite beneficial in determining the link between two business websites.
* **Web usage mining -** This is the process of collecting patterns and information from server logs in order to obtain insight into user behavior, such as where users are from, how many users clicked what item on the site, and what sorts of activities they are doing on the site. Users access data on the web and gather data in the form of logs in web use mining. As a result, Web use mining is also known as log mining.

## What are the challenges in Web Mining?

* **The Web seems to be too large for efficient data warehousing and data mining** − The Web's size is in the hundreds of gigabytes range, and it's continually increasing. Several public-accessible data are posted on the Web by several organizations and society. Setting up a data warehouse to duplicate, preserve, or combine data on the web is possible.
* **The complexity of Web pages is far greater than that of any traditional text document collection** −The structure of web pages is disjointed. They have significantly more differences in writing style and substance than any collection of books or other traditional text-based resources. The Web is viewed as a massive digital library, yet the massive amount of entries in this library are not sorted in any particular order. There is no index by element, title, author, cover page, table of contents, or any other criteria. In such a library, finding the information you need might be quite difficult.
* **The Web is a highly dynamic information source** - Not only does the Web expand fast, but its content is also updated on a regular basis. On the Web, news, financial markets, weather, sports, shopping, corporate ads, and a variety of other Web pages are updated on a regular basis. Access records and linkage information are also updated on a regular basis.
* **The Web serves a broad diversity of user communities** − The Internet already connects over 100 million computers, and its user base continues to grow at a rapid pace. Users might come from a variety of backgrounds, have different interests, and have different usage goals.

## Difference between Web Mining and Data Mining:

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| --- | --- | --- |
| **cPoints** | **Data Mining** | **Web Mining** |
| Definition | Data Mining is the process that attempts to discover pattern and hidden knowledge in large data sets in any system. | Web Mining is the process of data mining techniques to automatically discover and extract information from web documents |
| Application | Data Mining is very useful for web page analysis. | Web Mining is very useful for a particular website and e-service |
| Target Users | Data scientist and data engineers. | Data scientists along with data analysts. |
| Access | Data Mining is access data privately. | Web Mining is access data publicly. |
| Structure | In Data Mining get the information from explicit structure. | In Web Mining get the information from structured, unstructured and semi-structured web pages. |
| Problem Type | Clustering, classification, regression, prediction, optimization and control. | Web content mining, Web structure mining. |
| Tools | It includes tools like machine learning algorithms. | Special tools for web mining are Scrapy, PageRank and Apache logs. |
| Skills | It includes approaches for data cleansing, machine learning algorithms. Statistics and probability. | It includes application level knowledge, data engineering with mathematical modules like statistics and probability. |

**Android App Development**

* App stores and in-app advertising are expected to produce $693 billion in income for mobile apps in 2022. Furthermore, in 2022, workplace mobility is expected to be valued $510.39 billion.
* While many businesses are attempting to capitalize on this trend, many are unaware of how to properly develop an app. These growth estimates can help your firm succeed in the competitive marketplace, but only if they're backed up by a carefully maintained mobile app development process.
* Six critical steps make up an excellent app development process flow. We'll take a deeper look at each of them in this piece. Following this development approach, regardless of the size or scope of your project, will ensure that your enterprise mobile app development venture is a success.

## Android Development

* Among several mobile platforms, the Android operating system has the largest installed base. Android is used on hundreds of millions of mobile devices in more than 190 countries around the world.
* For the first time, a firm called Open Handset Alliance created Android, which is based on a modified version of the Linux kernel and other open-source software.
* The first Android-powered gadget hit the market in September 2008. It's user-friendly, has a large community behind it, allows for more customization, and a lot of businesses make Android-compatible cellphones.
* As a result, the market is witnessing a surge in demand for Android mobile application development, necessitating the hiring of knowledgeable developers with the necessary skill set. The original intent of Android was to be a mobile operating system.
* Android, on the other hand, has become an absolute set of software for all devices such as tablets, wearables, set-top boxes, smart TVs, notebooks, and so on, thanks to the advancement of code libraries and its appeal among developers in the diverging area.

## Features of Android Development

Android is a strong open-source operating system with a plethora of capabilities, some of which are detailed here:

* We may adapt the OS based on our needs thanks to the Android Open Source Project. For telephonic conversation or data transmission, Android supports many forms of connectivity such as GSM, CDMA, Wi-Fi, Bluetooth, and so on.
* We can couple with other devices using Wi-Fi technology while playing games or using other applications. It has a number of APIs that support location-tracking services like GPS.
* Using the file manager, we may manage all data storage-related actions. It supports a wide range of media formats, including AVI, MKV, FLV, MPEG4, and others, and can play or record a wide range of audio/video. It also supports JPEG, PNG, GIF, BMP, MP3, and other image formats.
* It allows you to use a camera and microphone to do playback or recording using multimedia technology. Android has an open-source Web Kit layout-based web browser that supports HTML5, CSS3, and other user interface standards.
* Multitasking is a feature of Android that allows us to run numerous applications at the same time and switch between them. It supports virtual reality as well as 2D/3D graphics.

## What are the Android Versions?

* On November 5, 2007, Google released the initial version of the Android platform. Since then, Google has released a slew of new Android versions with added functionality and features, including Apple Pie, Banana Bread, Cupcake, Donut, Gingerbread, Jellybeans, Lollipop, Marshmallow, Nougat, Oreo, and so on.
* The following table shows the version details of android which is released by Google from 2007 to date:

|  |  |  |  |
| --- | --- | --- | --- |
| **Code Name** | **Version** | **API Level** | **Release Date** |
| Apple Pie | Android 1.0 | 1 | September 23, 2008 |
| Donut | Android 1.6 | 4 | September 15, 2009 |
| Froyo | Android 2.3 – 2.3.3 | 8 | December 6, 2010 |
| Honeycomb | Android 3.0.x – 3.2.x | 11-13 | February 22, 2011 |
| KitKat | Android 4.4 – 4.4.4 | 19 | July 9, 2012 |
| Nougat | Android 7.0 – 7.1 | 24 – 25 | August 22, 2016 |
| Pie | Android 9.0 | 27 | August 6, 2018 |
| Android 11 | Android 11.0 | 30 | September 8, 2020 |

## What are the programming languages used in Developing Android Application?

1. Java
2. Kotin

Because Kotlin has been designated as an official language for Android development, it is favored by Google. Kotlin is created and maintained by Jet Brains. Before, Java was thought to be the official language for Android development. In Google I/O 2017, Kotlin was made official for Android development.

## Advantages of Android Development

* Because Android is an open-source operating system, it has a large support community.
* Google has provided design standards for the Android application, making it easier for developers to create more intuitive user applications.
* Android applications benefit from fragmentation since it provides them additional power. This implies the programme can execute two activities simultaneously on a single screen.
* When compared to other platforms, releasing an Android application through the Google Play store is easier.

## Disadvantages of Android Development

* Fragmentation provides a highly straightforward approach to user experience, but it has certain limitations, such as requiring time for the development team to adjust to the varied screen sizes of mobile telephones now available on the market and invoke the specific capabilities in the programme.
* The Android devices may differ significantly. As a result, application testing becomes more challenging.
* Depending on the application's complexity and features, the cost of the application may rise as development and testing take longer.

**Network Security**

# Network Security

* Network security refers to the steps taken by a company or organization to protect its computer network and data through the use of both hardware and software. This seeks to protect the data and network's confidentiality and accessibility. Every company or organization that deals with a lot of data has a set of measures in place to deal with a variety of cyber threats.
* The most basic example of network security is password protection, in which the network user chooses his or her own password. Network security has recently been a hot topic in cyber security, with many companies seeking applicants with expertise in this area.

# How does Network Security work?

* When it comes to network security in a business, there are numerous layers to consider. Attacks can occur at any layer of the network security layers model, so your network security hardware, software, and rules must be built to cover all of them.
* Physical, technological, and administrative controls are the most common types of network security controls. The main methods of network security and how each control works are described briefly below:

1. **Physical Network Security:**

This is the most basic level, which entails safeguarding the data and network by preventing unauthorized individuals from gaining access to the network's confidentiality. External peripherals, as well as routers, may be used for cable connections. Biometric systems, for example, can be used to achieve the same result.

1. **Technical Network Security:**

It primarily focuses on protecting the data stored in the network or data involved in transitions through the network. This type serves two purposes. One, protection from the unauthorized users and the other being protection from malicious activities.

1. **Administrative Network Security:**

This degree of network security safeguards user behavior, such as how permissions are provided and the authorization process is carried out. This also ensures the network's level of sophistication, which may be required to secure it from all types of attacks. This level also identifies any infrastructural modifications that must be made.

# Types of Network Security Devices

* **Active Devices:** Surplus traffic is blocked by these security measures. Examples of such equipment include firewalls, antivirus scanning devices, and content filtering devices.
* **Passive Devices:** Intrusion detection appliances, for example, are devices that recognize and report on unwanted traffic.
* **Preventive Devices:** These devices analyze networks for security flaws and alert users. Devices for penetration testing and vulnerability assessment, for example.
* **Unified Threat Management (UTM):** These gadgets are designed to be all-in-one security solutions. Firewalls, content screening, and web caching are just a few examples.
* **Firewalls:** A firewall is a type of network security device that controls and manages network traffic using protocols. A firewall separates a trusted internal network from the rest of the internet. Firewalls are available in the form of software that runs on hardware as well as hardware appliances. Hardware-based firewalls can also perform other tasks, such as operating as a DHCP server for the network.
* **Hardware and Software Firewalls:** Hardware firewalls are self-contained units. Broadband routers contain these as well. The majority of hardware firewalls provide at least four network ports for connecting to other computers. Corporate networking firewall solutions are available for bigger networks, such as for business purposes.
* **Antivirus:** An antivirus programme is a programme that detects and removes dangerous malware. It was created with the intention of detecting and removing viruses from computers. Modern antivirus software protects against viruses, worms, Trojan horses, adwares, spyware, key loggers, and other malware.
* **Content Filtering:** Content filtering devices screen unpleasant and offensive emails or webpages. These are used as a part of firewalls in corporations as well as in personal computers. These devices generate the message "Access Denied" when someone tries to access any unauthorized web page or email.

Content filtering can be divided into the following categories −

* Web filtering
* Screening of Web sites or pages
* E-mail filtering
* Screening of e-mail for spam
* Other objectionable content
* **Intrusion Detection System:** Intrusion Detection Systems, also known as Intrusion Detection and Prevention Systems, are network appliances that monitor harmful activity, log information about it, take action to stop it, and then report it.

Intrusion detection systems can also perform the following actions −

* Correct Cyclic Redundancy Check (CRC) errors
* Prevent TCP sequencing issues
* Clean up unwanted transport and network layer options

# What are the Goals for Network Security?

* A huge number of vulnerabilities exist in the network, as detailed in previous sections. As a result, the data is extremely sensitive to attacks during transmission. To fulfil his malicious goals, an attacker can target the communication channel, collect the data, and read or re-insert a bogus message.
* Network security is concerned not only with the security of the computers at each end of the communication chain, but also with the security of the entire network.
* Protecting the usefulness, reliability, integrity, and safety of a network and its data is what network security is all about. Effective network security prevents a wide range of dangers from infiltrating and propagating across a network.

The primary goal of network security are Confidentiality, Integrity, and Availability. These three pillars of Network Security are often represented as CIA triangle.

* **Confidentiality:** The purpose of secrecy is to keep sensitive company information safe from prying eyes. The confidentiality component of network security ensures that data is only accessible to those who are authorized to see it.
* **Integrity:** This goal entails ensuring and maintaining data correctness and consistency. The purpose of integrity is to ensure that data is accurate and not tampered with by unauthorized individuals.
* **Availability:** The purpose of availability in Network Security is to ensure that data, network resources, and services are always available to authorized users when they need them.

# Achieving Network Security

* It may appear that ensuring network security is a straightforward task. The objectives to be met appear to be uncomplicated. However, the methods utilized to attain these objectives are extremely complicated, and comprehending them necessitates sound reasoning.

International Telecommunication Union (ITU), in its recommendation on security architecture X.800, has defined certain mechanisms to bring the standardization in methods to achieve network security. Some of these mechanisms are:

* **En- cipherment:** This approach ensures data secrecy by converting data into unreadable forms for unauthorized individuals. This technique employs a secret-key encryption-decryption algorithm.
* **Digital Signatures:** In electronic data, this process is the electronic equivalent of ordinary signatures. It ensures that the data is accurate.
* **Access Control:** Access control services are provided using this technique. These techniques may leverage an entity's identification and authentication to determine and enforce the entity's access permissions.

# Network security for Business and Consumers

* Any organization that works with networked data and systems should prioritise network security. Network security can manage network traffic more efficiently, improve network performance, and ensure secure data sharing between employees and data sources, in addition to protecting assets and the integrity of data from external exploits.
* Many tools, programs, and utilities are available to assist you in protecting your networks from attack and outage. Force point offers a set of network security solutions that centralize and simplify what might be complicated processes while also ensuring that your network is secure across the board.

# Difference between Cyber Security and Network Security

|  |  |
| --- | --- |
| **Network security** | **Cyber Security** |
| It safeguards data as it travels over the network. | It safeguards data stored on devices and servers. |
| Cyber security is a subset of it. | Information security is a subset of it. |
| It safeguards all network-related data. | It safeguards everything in cyberspace. |
| It is concerned with the prevention of denial-of-service attacks. | It is concerned with the prevention of cyber-attacks. |
| Only the data in transit is protected by network security. | Cyber security guarantees that all digital data is protected. |

**Internet of Things (IoT)**

# Internet of Things (IOT)

* The Internet of Things (IoT) is a sophisticated automation and analytics system that uses networking, sensors, big data, and artificial intelligence to create comprehensive systems for a product or service. When applied to any industry or system, these systems provide more transparency, control, and performance.
* Because of its inherent versatility and ability to work in any environment, IoT systems have applications in a variety of industries. They use smart devices and sophisticated enabling technologies to improve data collecting, automation, operations, and much more.

# What are the key features of IOT?

* **AI –** The Internet of Things (IoT) essentially turns anything into a "smart" device, enhancing every area of life through the use of data collecting, artificial intelligence algorithms, and networks. This may be as simple as adding sensors to your refrigerator and cabinets to detect when milk and your favorite cereal are running short and placing an order with your chosen grocer.
* **Connectivity -** Because of new networking enabling technologies, particularly IoT networking, networks are no longer only dependent on big providers. Networks can be built on a much smaller and less expensive scale and still be functional. These small networks are created by IoT between its system devices.
* **Sensors –** Without sensors, the Internet of Things loses its uniqueness. They function as defining instruments, transforming the Internet of Things from a passive network of devices to an active system capable of real-world integration.
* **Active Engagements –** Passive engagement accounts for a large portion of today's connection with linked technologies. The Internet of Things (IoT) ushers in a new era of active content, product, and service interaction.
* **Small Devices –** Over time, devices have become smaller, cheaper, and more powerful, as planned. To achieve precision, scalability, and versatility, IoT relies on purpose-built tiny devices.

# Advantages of IoT

The advantages of IoT span across every area of lifestyle and business. Here is a list of some of the advantages that IoT has to offer −

* **Improved Customer Engagement:** Current analytics include blind spots and substantial accuracy issues, and, as previously stated, interaction is still passive. This is fundamentally transformed by the Internet of Things in order to generate a richer and more effective relationship with audiences.
* **Technology Optimization:** The same technologies and data that improve customer experience also increase device utilization and help to make more powerful technological advancements. The Internet of Things (IoT) opens up a world of vital functional and field data.
* **Reduced Waste:** The Internet of Things identifies areas for improvement. Current analytics provide only a surface level of insight, whereas IoT gives real-time data that leads to more efficient resource management.
* **Enhanced Data Collection:** Modern data collecting has limitations and is designed for passive consumption. IoT takes it out of those settings and puts it right where humans want to go to evaluate their surroundings. It provides a complete picture of everything.

# Disadvantages of IoT

Though IoT delivers an impressive set of benefits, it also presents a significant set of challenges. Here is a list of some its major issues –

* **Security:** The Internet of Things (IoT) provides a networked ecosystem of constantly connected gadgets. Despite any security safeguards, the technology provides little control. As a result, users are vulnerable to many types of attackers.
* **Privacy:** Without the user's active participation, the sophistication of IoT delivers substantial personal data in extreme detail.
* **Complexity:** Given the utilization of various technologies and a huge number of new supporting technologies, some people believe IoT systems are difficult to design, implement, and maintain.
* **Flexibility:** Many people are concerned about an IoT system's ability to readily interact with other systems. They are concerned about ending up with multiple contradictory or closed systems.
* **Compliance:** Regulations apply to IoT, just as they do to any other company technology. Because of its complexity, the issue of compliance appears to be extremely difficult, even if many people perceive standard software compliance to be a battle.

# Uses of IoT

* **Engineering, Industry and Infrastructure:** In these domains, IoT can be used to improve production, marketing, service delivery, and safety. IoT provides a powerful tool for monitoring a variety of operations, and true transparency makes improvement opportunities more visible.
* **Government and Safety:** Improved law enforcement, defense, city planning, and economic management are all possible with IoT in government and safety. The technology closes existing gaps, corrects various defects, and broadens the scope of these activities.
* **Home and Office:** IoT delivers a customized experience in our daily lives, from the home to the office to the businesses we commonly do business with. This raises our overall happiness, increases our productivity, and improves our health and safety.
* **Health Machine:** The Internet of Things (IoT) propels us closer to our envisioned future of medicine, which relies on a highly interconnected network of sophisticated medical equipment. Today, the Internet of Things (IoT) has the potential to significantly improve medical research, equipment, treatment, and emergency care. All of these features are combined to deliver more accuracy, greater attention to detail, faster reaction times to events, and continuous improvement while lowering the traditional overhead of medical research and organizations.

# Internet of Things - Software

* **Data Collection:** Sensing, measurements, light data filtering, light data security, and data aggregation are all managed by this programme. Certain protocols are used to let sensors connect to real-time, machine-to-machine networks. The data is then collected from many devices and distributed according to the parameters.
* **Device Integration:** The body of the IoT system is created by software that binds (dependent relationships) all system devices. It guarantees that gadgets function together and are connected in a reliable manner. These apps are the IoT network's defining software technology since it wouldn't be an IoT system without them.
* **Real-Time Analytics:** These programmes gather data or input from a variety of sources and turn it into actionable steps or patterns that can be analyzed by humans. They analyze data using a variety of settings and designs in order to conduct automation-related activities or offer industry with data.
* **Application and Process Extension:** These applications broaden the scope of current systems and software, allowing for a more comprehensive and effective system. They connect preset devices for specific objectives, such as granting access to specific mobile devices or technical instruments. It contributes to increased productivity and more precise data collecting.

# Internet of Things – Hardware

* **Sensors:** Sensors may be the most significant piece of IoT hardware. Energy modules, power management modules, RF modules, and sensor modules make up these devices. Signal processing, Wi Fi, ZigBee, Bluetooth, radio transceiver, duplexer, and BAW are all used by RF modules to handle communications.
* **Wearable Electronics:** Small electronic devices worn on the head, neck, arms, chest, and feet are known as wearable electronic gadgets. Smartwatches not only keep us connected, but as part of an IoT system, they also provide access to data that may help us be more productive. Smart glasses allow us to consume more of the material and services we like, and when used in conjunction with an IoT system, they provide a new approach to productivity.
* **Standard Devices:** The command center and remotes for IoT are still the PC, tablet, and cellphone.
* The user has the most control over the system and its settings when using the desktop.
* The **tablet** functions as a remote and enables access to the system's major capabilities in a manner similar to a desktop.
* The **telephone** has some basic settings that may be changed, as well as remote capability.

Standard network equipment such as **routers** and **switches** are also important linked gadgets.