KSR College of Engineering

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AN AUTONOMOUS INSTITUTION

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B.E. - COMPUTER SCIENCE & ENGINEERING (IoT)

Magazine

(Academic Year 2024-25)

VISION OF THE INSTITUTE

We envision to achieve status as an excellent educational institution in the global knowledge hub, making self-learners, experts, ethical and responsible engineers, technologies, scientists, managers, administrators, and entrepreneurs who will significantly contribute to research and environment-friendly sustainable growth of the nation and the world.

MISSION OF THE INSTITUTE

To inculcate in the students' self-learning abilities that enable them to become competitive and considerate engineers, technologists, scientists, managers, entrepreneurs, and administrators by diligently imparting the best of education, nurturing environmental and social needs. To foster and maintain a mutually beneficial partnership with global industries and Institutions through knowledge sharing, collaborative research, and innovation.

VISION OF THE DEPARTMENT

To develop skilled IoT professionals with expertise in intelligent connectivity and sustainable digital ecosystems

MISSION OF THE DEPARTMENT

1. Provide value-based and industry-aligned education in Computer Science and IoT through innovative pedagogy and modern technologies
2. Empower technical and problem-solving skills in the field of IoT through state of art laboratories
3. Promote interdisciplinary research and collaboration in emerging technologies for creating sustainable solutions.

K.S.R COLLEGE OF ENGINEERING

(AUTONOMOUS)

Thiru. R. SRINIVASAN, B.B.M.

Chairman,

KSR Educational Institutions.

Message

As we stand on the brink of new beginnings and boundless possibilities, I am filled with an immense sense of pride and optimism about what we can achieve together at KSR Educational Institutions. Our founder, Dr. K. S. Rangasamy, laid a strong foundation rooted in the belief that education is the most powerful tool to transform lives. Carrying forward his legacy, we remain committed to not just educating but empowering young minds to make a meaningful impact in the world.

In today's fast-paced, technology-driven society, the challenges are as dynamic as the opportunities are great. It is imperative for education to transcend traditional learning and encompass the development of holistic, innovative, and critical thinking skills. At KSR, we strive to equip you, our students, with the capabilities to not only adapt to changes but to drive them. We are dedicated to nurturing a generation of leaders, innovators, and thinkers who are ready to take on global challenges with local sensibilities

Warm regards,

R. Srinivasan, Chairman,

KSR Educational Institutions

K.S.R COLLEGE OF ENGINEERING

(AUTONOMOUS)

Dr.M. VENKATESAN, M.E., Ph.D.,

PRINCIPAL

Message

As a Principal of KSRCE, I actively play my role to facilitate students to become best academicians, researchers and policy makers. I provide a diverse and inclusive work environment to my colleagues and drive them wherever necessary to play a role in getting utmost national and international agencies support Institution. A collaborative and integrated approach towards teaching, learning and research will be emphasized. I strongly believe that the KSRCE team will overcome the constraints facing to deliver the best Engineering services to the society and reach the desired goals.

With Regards,

Dr. M. Venkatesan

Principal

K.S.R COLLEGE OF ENGINEERING

(AUTONOMOUS)

Dr.N. SARAVANAN, M.E., Ph.D.,

HoD / CSE (IoT)

Message

As a Head of Department of KSRCE CSE (IoT), I actively play my role to facilitate students to become best academicians, researchers and policy makers. I provide a diverse and inclusive work environment to my colleagues and drive them wherever necessary to play a role in getting utmost national and international agencies support Institution. A collaborative and integrated approach towards teaching, learning and research will be emphasized. I strongly believe that the KSRCE team will overcome the constraints facing to deliver the best Engineering services to the society and reach the desired goals.

With Regards,

Dr. N. SARAVANAN

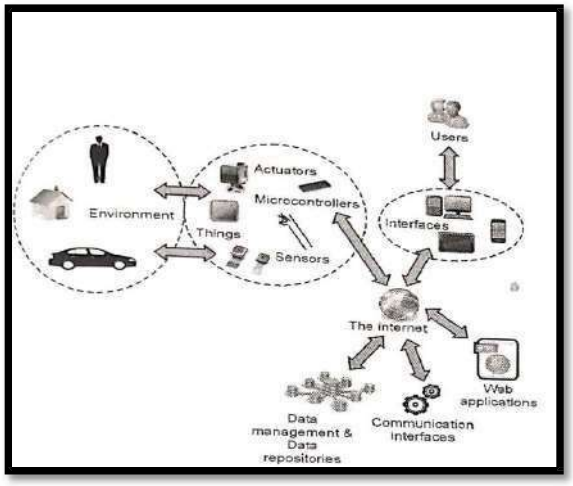
HoD/ CSE (IoT)

S. NO	NAME OF THE ARTICLES
1	Introduction to Internet of Things
2	IoT in Various sectors : Solutions and Applications
3	Top Applications of IoT in the World
4	IoT Security Challenges
5	IoT In Health Care Industry

Introduction to Internet of Things (IoT)

IoT stands for Internet of Things. It refers to the interconnectedness of physical devices, such as appliances and vehicles, that are embedded with software, sensors, and connectivity which enables these objects to connect and exchange data. This technology allows for the collection and sharing of data from a vast network of devices, creating opportunities for more efficient and automated systems.

Internet of Things (IoT) is the networking of physical objects that contain electronics embedded within their architecture to communicate and sense interactions amongst each other or with respect to the external environment. In the upcoming years, IoT-based technology will offer advanced levels of services and practically change the way people lead their daily lives. Advancements in medicine, power, gene therapies, agriculture, smart cities, and smart homes are just a few of the categorical examples where IoT is strongly established.



History of IOT

Here you will get to know about how IOT is involved and from the explanation of each will let you know how IOT plays a role in these innovations!

1982 - Vending machine: The first glimpse of IoT emerged as a vending machine at Carnegie Mellon University was connected to the internet to report its inventory and status, paving the way for remote monitoring.

1990 - Toaster: Early IoT innovation saw a toaster connected to the internet, allowing users to control it remotely, foreshadowing the convenience of smart home devices.

1999 - IoT Coined (Kevin Ashton): Kevin Ashton coined the term "Internet of Things" to describe the interconnected network of devices communicating and sharing data, laying the foundation for a new era of connectivity.

2000 - LG Smart Fridge: The LG Smart Fridge marked a breakthrough, enabling users to check and manage refrigerator contents remotely, showcasing the potential of IoT in daily life.

2004 - Smart Watch: The advent of smartwatches introduced IoT to the wearable tech realm, offering fitness tracking and notifications on-the-go.

2007 - Smart iPhone: Apple's iPhone became a game-changer, integrating IoT capabilities with apps that connected users to a myriad of services and devices, transforming smartphones into hubs.

2009 - Car Testing: IoT entered the automotive industry, enhancing vehicles with sensors for real-time diagnostics, performance monitoring, and remote testing.

2011 - Smart TV: The introduction of Smart TVs brought IoT to the living room, enabling internet connectivity for

streaming, app usage, and interactive content.

2013 - Google Lens: Google Lens showcased IoT's potential in image recognition, allowing smartphones to provide information about objects in the physical world.

2014 - Echo: Amazon's Echo, equipped with the virtual assistant Alexa, demonstrated the power of voice-activated IoT, making smart homes more intuitive and responsive.

2015 - Tesla Autopilot: Tesla's Autopilot system exemplified IoT in automobiles, introducing semi-autonomous driving capabilities through interconnected sensors and software.

Four Key Components of IOT

- Device or sensor
- Connectivity
- Data processing
- Interface

IoT is network of interconnected computing devices which are embedded in everyday objects, enabling them to send and receive data.

Main Components Used in IoT

Sensors: Sensors are the major part of any IoT application. It is a physical device that measures and detects certain physical quantities and converts it into signal which can be provided as an input to processing or control unit for analysis purpose.

Different types of Sensors

- Temperature Sensors
- Image Sensors
- Gyro Sensors
- Obstacle Sensors
- RF Sensor /IR Sensor
- MQ-02/05 Gas Sensor
- LDR Sensor
- Ultrasonic Distance Sensor

Control Units: It is a unit of small computer on a single integrated circuit containing microprocessor or processing core, memory, and programmable input/output devices/peripherals. It is responsible for major processing work of IoT devices and all logical operations are carried out here.

Cloud computing: Data collected through IoT devices is massive, and this data has to be stored on a reliable storage server. This is where cloud computing comes into play. The data is processed and learned, giving more room for us to discover where things like electrical faults/errors are within the system.

Networking connection: To communicate, internet connectivity is a must, where each physical object is represented by an IP address. However, there are only a limited number of addresses available according to the IP naming. Due to the growing number of devices, this naming system will not be feasible anymore. Therefore, researchers are looking for another alternative naming system to represent each physical object.

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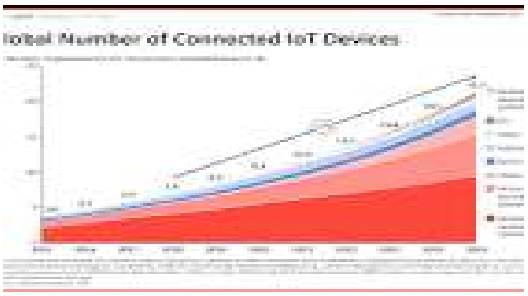
IoT in Various Sectors: Solutions and Applications

IoT is being used globally across various sectors to improve efficiency, automate processes, and enhance decision-making. From smart homes and cities to industrial manufacturing and healthcare, IoT devices and applications are transforming how we live and work by connecting everyday objects to the internet. The number of connected devices is rapidly increasing, with projections reaching billions by 2030.

Incorporating IoT in Transportation Systems



Here's a breakdown of IoT usage across different areas:

Smart Homes:

IoT devices like smart thermostats, lighting systems, and security cameras allow for remote control and automation of home functions, enhancing convenience and energy efficiency.

Examples include smart refrigerators that track food inventory and notify users of expiring items, and smart lighting systems that adjust based on occupancy and time of day.

Smart Cities:

IoT applications are used to optimize city infrastructure, improve public safety, and enhance resource management. Smart parking systems, traffic management solutions, and environmental monitoring sensors are examples of how IoT is being used to create more efficient and sustainable urban environments.Data from IoT sensors can be used to optimize traffic flow, reduce pollution, and improve public safety by monitoring air quality and detecting potential hazards.

Industrial IoT (IIoT):

IoT devices and platforms are transforming manufacturing processes by enabling real-time monitoring of equipment, optimizing production efficiency, and improving supply chain management. Sensors can track machine performance, identify potential maintenance issues, and optimize energy consumption. IIoT solutions are also being used to improve worker safety, manage inventory, and enhance logistics.

Healthcare:

IoT devices are revolutionizing healthcare by enabling remote patient monitoring, personalized treatment plans, and improved diagnostic capabilities. Wearable sensors can track vital signs, activity levels, and sleep patterns, providing valuable data for healthcare professionals. IoT-enabled devices can also be used for medication management, fall detection, and remote consultation, improving patient outcomes and reducing healthcare costs.

operational costs - including the monitoring and reporting of truck refrigeration.

Let us look at some examples of IoT in transportation.

Traffic congestion on city streets Intelligent Transportation Systems (ITS), also called Smart Traffic Management Systems (STMS), do this by connecting sensors, cameras and other traffic monitoring technology with traffic control systems such as traffic lights, dynamic messages boards and in-vehicle communication and warning systems.

Here are some of the problems that IoT for traffic management can address:

Congestion: Traffic jams waste both time and fuel, as streets and roads built more than a century ago are forced to carry unprecedented volumes of traffic.

Safety: Many collisions occur at intersections, where better signal control could create smoother, safer, more predictable traffic flow.

Pollution: Motor vehicle emissions can be reduced significantly by traffic management systems that enable cars and trucks to spend less time idling in traffic.

Emergency response: Emergency vehicles including police, fire and ambulance need to take priority regardless of the traffic conditions.

IoT in Public Transportation

IoT solutions are used in a multitude of transit applications for bus, light rail and paratransit.

IoT applications can be used for multiple systems:

- Routing and dispatch
- Vehicle engine monitoring
- Real-time security cameras
- Passenger Wi-Fi
- Digital signage

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Development of IoT in the World

IoT has made our life easier with its applications. You won't believe all the cool stuff IoT can do! Imagine having a home where the lights turn on by themselves, the TV knows your favorite shows, and even the fridge tells you when you're running out of ice cream! Yum!

1. Smart Agriculture

Food is an integral part of life without which we cannot survive. However, it is an unfortunate fact that a lot of food is wasted in developed countries like America while people starve in poorer countries like Chad, Sudan, etc. One way to feed everyone is through better agricultural practices which can be enhanced using IoT applications. This can be done by first collecting data for a farm such as soil quality, sunlight levels, seed type, and rainfall density from various sources like farm sensors, satellites, local weather stations, etc. and then using this data with Machine Learning and IoT to create custom recommendations for each farm that will optimize the planting procedure, irrigation levels required, fertilizer amount, etc. All this will result in better yield or crops with a focus on reducing world hunger in the future.

2. Smart Vehicles

Smart vehicles or self-driving cars are Iot applications as they can be called are dependent on IoT. These cars have a lot of features that are integrated with each other and need to communicate such as the sensors that handle navigation, various antennas, controls for speeding or slowing down, etc. Here the Internet of Things technology is critical, especially in the sense that self-driving cars need to be extremely accurate and all the parts need to communicate with each other in milliseconds on the road. Tesla Cars are quite popular and working on their self-driving cars. Tesla Motors' cars use the latest advancements in Artificial Intelligence and the Internet of Things. And they are quite popular as well!!! Tesla Model 3 was the most sold plug-in electric car in the U.S. in 2018 with a total yearly sales of around 140,000 cars. This top IoT application has gained a lot of advancement in recent years

3. Smart Home

Maybe one of the most famous applications of IoT is in Smart Homes. After all, who hasn't heard about connecting all the home applications like lighting, air conditioners, locks, thermostat, etc. into a single system that can be controlled from your smartphone? These IoT devices are applications of IoT and becoming more and more popular these days because they allow you complete freedom to personalize your home as you want. In fact, these IoT devices are so popular that every second there are 127 new devices connected to the internet. Some popular ones that you might have heard have, or even have in your home, include Google Home, Amazon Echo Plus, Philips Hue Lighting System, etc. There are also all sorts of other inventions that you can install in your home including Nest Smoke Alarm and Thermostat, Foobot Air Quality Monitor, August Smart Lock, etc.

These applications of IoT are getting famous nowadays.

4. Smart Pollution Control

Pollution is one of the biggest problems in most of the cities in the world. Sometimes it's not clear if we are inhaling oxygen or smog! In such a situation, IoT applications can be a big help in controlling pollution levels to more breathable standards. This can be done by collecting data related to city pollution like emissions from vehicles, pollen levels, airflow direction, weather, traffic levels, etc using various sensors in combination with IoT. Using this data, Machine Learning algorithms can calculate pollution forecasts in different areas of the city that inform city officials beforehand where the problems are going to occur. Then they can try to control the pollution levels till it's much safer.

5. Smart Healthcare

There are many applications of IoT in the Healthcare Industry where doctors can monitor patients remotely through a web of interconnected devices and machines without needing to be in direct contact with them. This is very useful if the patients don't have any serious problems or if they have any infectious diseases like COVID-19 these days. One of the most common uses of IoT applications in healthcare is using robots. These include surgical robots that can help doctors in performing surgeries more efficiently with higher precision and control. There are also disinfectant robots that can clean surfaces quickly and thoroughly using high-intensity ultraviolet light (which is pretty useful these days!)

6.Smart Cities

Cities can be made more efficient so that they require fewer resources and are more energy-efficient. This can be done with a combination of sensors in different capacities all over the city that can be used for various tasks ranging from managing the traffic, controlling handling waste management, creating smart buildings, optimizing streetlights, etc. There are many cities in the world that are working on incorporating IoT applications and becoming smarter such as Singapore, Geneva, Zurich, Oslo, etc.

7.Smart Retail

There is a way to make shopping even more exciting for customers and that's to use the latest tech like IoT of course! Retail stores can make use of IoT applications in a wide range of operations to make shopping a much smoother experience for customers and also easier for employees. IoT can be used to handle inventory, improve store operations, reduce shoplifting and theft, and prevent long queues at the cashiers. A prime example of this application of IoT is the Amazon Go stores which provide an IoT-enabled shopping experience.

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IoT Security Challenges

The IoT attack surface expands every day as more and more devices come online–from our smartwatches and smart TVs, to our smart homes and smart cars, to the ever-growing industry IoT. In addition to consumer goods, IoT sensors are widely used in healthcare, manufacturing, and supply chain operations, as well as for green agriculture, the economy, and national defense.

Burgeoning IoT spans virtually any device or sensor that connects to the internet-from a large container on an ocean barge to a small Tile Tracker for your phone. To underscore, the IEEE IoT technology forecast of connected devices is expected to increase by about 300% from 8.7 billion devices in 2020 to more than 25 billion IoT devices in 2030.

Given the expanded attack surface for security risks to availability, integrity and confidentiality, IoT security is critical for organizations to protect their network environments from IoT device-borne threats.

How To Address IoT Security Requirements?

IoT and security requirements can only be accomplished with an integrated solution that delivers visibility, segmentation, and protection throughout the entire network infrastructure, such as a holistic security fabric approach.

Your IoT security must contain the following key abilities:

Learn: With complete network visibility, security solutions can authenticate and classify IoT devices to build a risk profile and assign them to IoT device groups.

Segment: Once the enterprise understands its IoT attack surface, IoT devices can be segmented into policy-driven groups based on their risk profiles.

Protect: The policy-driven IoT groups and internal network segmentation enable monitoring, inspection, and policy enforcement based on the activity at various points within the infrastructure.

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IoT In Health Care Industry

Internet of Things (IoT)-enabled devices have made remote monitoring in the healthcare sector possible, unleashing the potential to keep patients safe and healthy, and empowering physicians to deliver superlative care. It has also increased patient engagement and satisfaction as interactions with doctors have become easier and more efficient. Furthermore, remote monitoring of patient's health helps in reducing the length of hospital stay and prevents re-admissions. IoT also has a major impact on reducing healthcare costs significantly and improving treatment outcomes.

IoT is undoubtedly transforming the healthcare industry by redefining the space of devices and people interaction in delivering healthcare solutions. IoT has applications in healthcare that benefit patients, families, physicians, hospitals and insurance companies.

IoT for Patients - Devices in the form of wearables like fitness bands and other wirelessly connected devices like blood pressure and heart rate monitoring cuffs, glucometer etc. give patients access to personalized attention. These devices can be tuned to remind calorie count, exercise check, appointments, blood pressure variations and much more.

IoT has changed people's lives, especially elderly patients, by enabling constant tracking of health conditions. This has a major impact on people living alone and their families. On any disturbance or changes in the routine activities of a person, alert mechanism sends signals to family members and concerned health providers.

IoT for Physicians - By using wearables and other home monitoring equipment embedded with IoT, physicians can keep track of patients' health more effectively. They can track patients' adherence to treatment plans or any need for immediate medical attention. IoT enables healthcare professionals to be more watchful and connect with the patients proactively. Data collected from IoT devices can help physicians identify the best treatment process for patients and reach the expected outcomes.

IoT for Hospitals - Apart from monitoring patients' health, there are many other areas where IoT devices are very useful in hospitals. IoT devices tagged with sensors are used for tracking real time location of medical equipment like wheelchairs, defibrillators, nebulizers, oxygen pumps and other monitoring equipment. Deployment of medical staff at different locations can also be analyzed real time.

The spread of infections is a major concern for patients in hospitals. IoT-enabled hygiene monitoring devices help in preventing patients from getting infected. IoT devices also help in asset management like pharmacy inventory control, and environmental monitoring, for instance, checking refrigerator temperature, and humidity and temperature control.

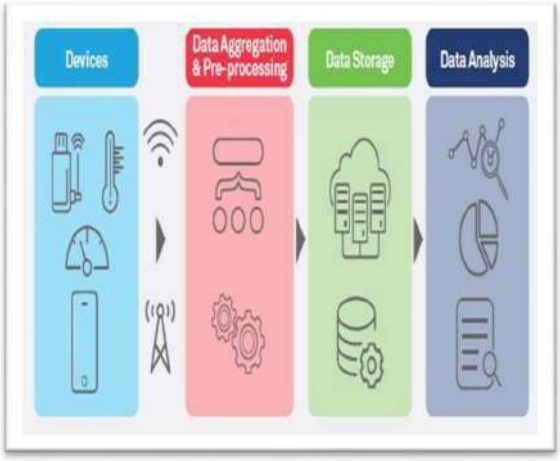
IoT for Health Insurance Companies – There are numerous opportunities for health insurers with IoT-connected intelligent devices. Insurance companies can leverage data captured through health monitoring devices for their underwriting and claims operations. This data will enable them to detect fraud claims and identify prospects for underwriting. IoT devices bring transparency between insurers and

customers in the underwriting, pricing, claims handling, and risk assessment processes. In the light of IoT-captured data-driven decisions in all operation processes, customers will have adequate visibility into underlying thought behind every decision made and process outcomes.

Insurers may offer incentives to their customers for using and sharing health data generated by IoT devices. They can reward customers for using IoT devices to keep track of their routine activities and adherence to treatment plans and precautionary health measures. This will help insurers to reduce claims significantly. IoT devices can also enable insurance companies to validate claims through the data captured by these devices.

Redefining Healthcare

IoT has a four-step architecture that are basically stages in a process



All four stages are connected in a manner that data is captured or processed at one stage and yields the value to the next stage. Integrated values in the process brings intuitions and deliver dynamic business prospects.

Step 1: First step consists of deployment of interconnected devices that includes sensors, actuators, monitors, detectors, camera systems etc. These devices collect the data.

Step 2: Usually, data received from sensors and other devices are in analog form, which need to be aggregated and converted to the digital form for further data processing.

Step 3: Once the data is digitized and aggregated, this is pre-processed, standardized and moved to the data center or Cloud.

Step 4: Final data is managed and analyzed at the required level. Advanced Analytics, applied to this data, brings actionable business insights for effective decision-making.

IoT is redefining healthcare by ensuring better care, improved treatment outcomes and reduced costs for patients, and better processes and workflows, improved performance and patient experience for healthcare providers.

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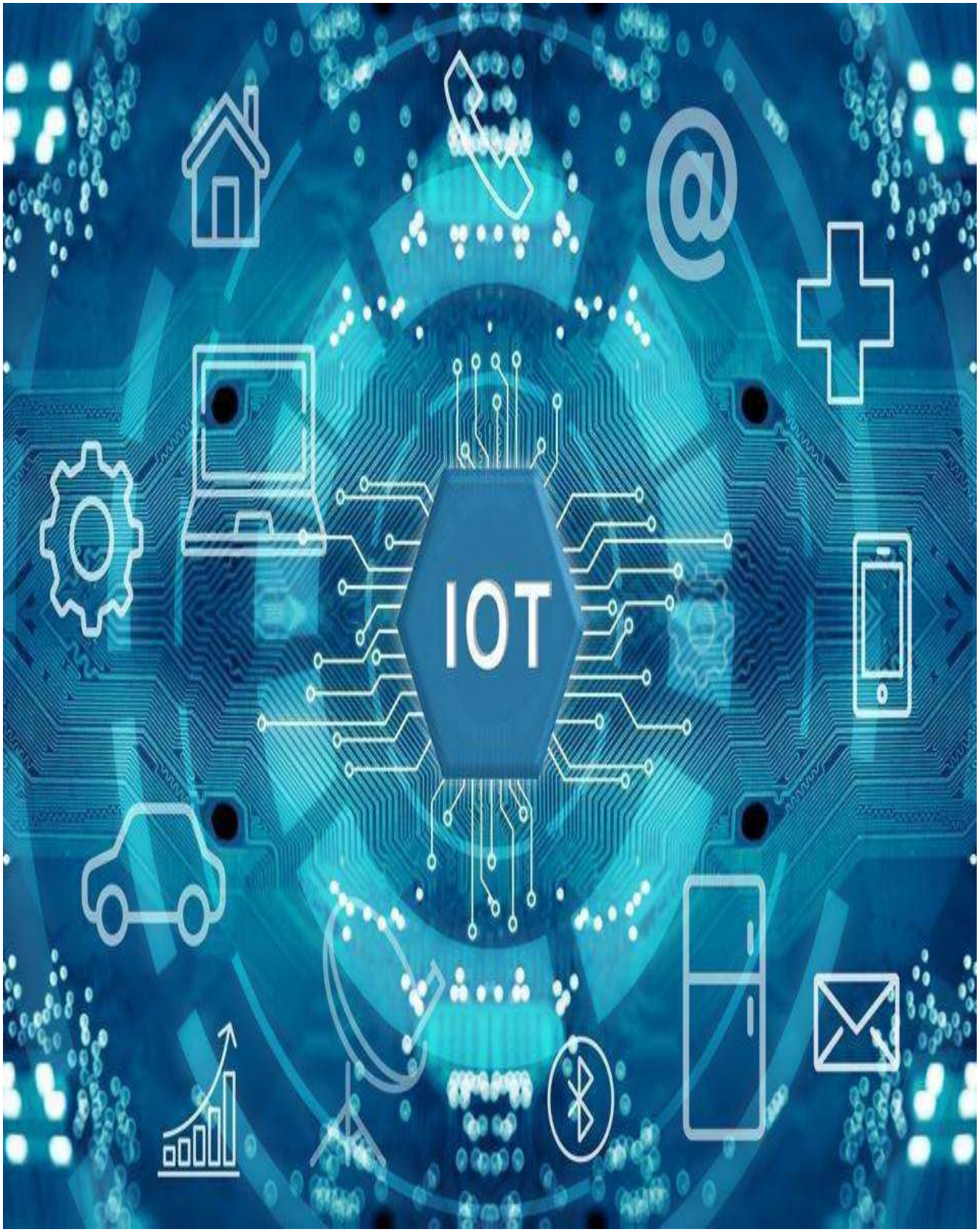
IOT