

IOT And Its Smart Applications: A Schematic Review

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Abstract

Over the last several years, IoT has become one of the most crucial technologies of the 21st century. People, processes, and even things may now communicate seamlessly thanks to embedded technologies that connect everyday items like kitchen appliances and cars to the internet. Low-cost computers, the cloud, big data as well as the mobile technologies allow physical things to share and collect data without the need for human intervention. Computerized systems can monitor, record, and modify every interaction between linked devices in this hyper connected world. The physical as well as digital worlds come together in a unique way. This review lists some of the advanced applications of IoT technology in different aspects of life.

Keywords Internet of Things (IoT), cloud, big data, analytics

1. INTRODUCTION

It's called the "internet of things" (IoT), and it's a network of interconnected devices that can transport data across a network without the need for human or computer-to-human contact, including “computers, mechanical and digital equipment, animals, objects, and humans”. A "thing" on the internet of things is anything with an Internet Protocol (IP) address as well as the capacity to transmit & receive data across

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a network. People with the implanted heart monitors, livestock with the biochip transponders, as well as autos with the tire pressure sensors are all included in this category. The “Internet of Things” (IoT) is increasingly being used by businesses across a wide range of sectors to improve “operational efficiency”, get a better understanding of their consumers, improve decision-making, and raise the value of the company. There are a slew of new IoT cloud applications popping up across a wide range of industries. Current IoT use cases span a wide range of industries and services such as industry (industrial), agriculture (agricultural), health care (healthcare), smart cities (security), and many more. Internet of Things (IoT) makes it possible to create and deploy smart devices that address current concerns and problems in the real world. Smart technologies like smart houses, smart automobiles, smart TVs, and smartwatches are already commonplace in our daily lives because they make our lives simpler and more efficient.

The Municipal Corporation chooses to fix a certain route, for example. Traffic on the route to a major interstate may get backed up as a result of this. An alert has been generated and sent to the city's traffic monitoring system with this new information. Machine Learning may be used to swiftly learn and anticipate traffic patterns in a smart traffic system like this one. It is thus possible for a smart system to assess the situation, estimate the effect on other cities connected to the same roadway, and send this knowledge to them.



Figure 57 a network of self-dependent systems

In order to minimize traffic jams, the Traffic Management System may evaluate the data collected and provide alternate routes around the construction site. Additionally, drivers might get live directions through radio as well as smart devices. Meanwhile, it's possible that nearby municipal schools and employers may have to change their timetables.

This is just one example of how the Internet of Things is making a difference in the world of healthcare (SHSS). Monitors our health with a tiny sophisticated gadget. Patients at trauma centers and other high-

acuity medical facilities often have this equipment on hand to keep tabs on their rapidly deteriorating health. Is there any question in anyone's mind that the internet and smart gadgets have become an integral part of our daily lives?

LITERATURE REVIEW

[1] The “Internet of Things” (IoT) use for smart cities is quickly expanding. In order to link their many components (smart gadgets), these smart cities mostly depend on the wireless sensors. This requirement for a vast IoT network of linked devices is the result of the convergence of IoT as well as 5G technologies in the smart cities. 80% of the present IoT network's data traffic comes from the indoor wireless networks (e.g., smart houses, smart hospitals, smart industries, or smart school buildings). Security and privacy issues have become a key worry for billions of IoT smart devices as smart cities as well as their applications proliferate. It is possible that the producers of IoT devices fail to adequately address the security concerns of these devices, allowing attackers to take advantage of the vulnerabilities in these devices via various assaults, such as DDoS and injection attacks. One method of detecting and mitigating the danger of such assaults is intrusion detection. In this work, a technique for detecting injection attacks in “Internet of Things” (IoT) applications is presented (e.g. smart cities). Several machine learning classifiers (i.e., “SVM, Random Forest, as well as Decision Tree”) were evaluated using this strategy, which uses two kinds of feature selection strategies (constant removal as well as recursive feature elimination). For the purpose of determining whether or not this suggested feature selection approach is of high quality, we used the T-Test. With just 8 features picked using the suggested feature selection strategy, the decision tree classifier was shown to be 99 percent accurate in detecting injection assaults on AWID, a publicly available data set. In addition, the comparison of the suggested intrusion detection approach to the most relevant work demonstrated its benefits.

[2] A general introduction to the field of crowdsensing is provided in this article, along with examples of how it may be used. As part of the data collection process, crowdsensing uses a data system based on many client encounters. It is also possible to send messages more often if they include the general information about the smart cities in your text messages. The Crowd sensing layers which characterize Mobile Crowd sensing were described in this paper. An application in the Coalition Game that makes use of GPS and crowdsensing is described in this article. The Mobile Crowdsensing System was also highlighted in this study, as well as how vital the cloud is to wireless networks, the Internet of Things (IoT), as well as data collecting. Even more importantly, our study has also built a sophisticated crowd-sensing parking system that reduces time-wasting users.

[3] Cisco estimates that the Internet of Things industry will expand fast and link 50 billion devices to the Internet by 2020, according to their figures. A smart home/network building of interconnected gadgets is intended to make life more convenient, tasty, and pleasurable for everyone who lives in it. In an ideal world, all devices would operate right away without the need for users to fiddle with them. Despite this, linked devices come from a variety of vendors and use a variety of communication protocols. There is still a lot of room for improvement when it comes to procedures. These interactions are still restricted, despite recent attempts to increase protocol compatibility. An “Internet of Things”

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(IoT) platform may be used to ease their interaction, operate them intelligently through a web interface or a voice assistant, and thereby address this problem. In order to increase device interoperability in the Internet of Things, we outline connection standards in this article (IoT). To create a "network of things" by implementing a Web application and providing virtual help that works with any device, operating system, the service provider, or the "transport technology".

[4] Others affected with the infectious illness COVID-19 may readily infect those around them, which make it a major public health concern. Research communities throughout the world are working tirelessly to avoid COVID-19 and limit its effect on "sustainable smart cities" by utilizing the new technologies, as well as the Internet of Things (IoT) is a pioneer among them. A key function for the "Internet of Things" (IoT) is to reduce the enormous infectious rate by utilizing new healthcare IoT applications in long-term smart cities. As a result, the primary goal of this study is to describe a review of the new healthcare IoT applications applied in the context of the COVID-19 pandemic and to highlight current obstacles to determine the research paths for the future. COVID-19 literature assessment from 2019 to 2021 in the context of growing healthcare IoT technologies is one of the most significant contributions of this effort. In addition, we expand the linked contributions of this study by noting the weak points of the present growing healthcare IoT applications, security of multiple network levels and secure communication environment, followed by some connected needs to solve these difficulties. And we highlight future research areas in sustainable smart cities with the most productive outcomes and the cheapest network deployment costs for rising healthcare IoT adoption in COVID-19.

[5] By connecting various sensors around us to the Internet, the "Industrial Internet of Things" (IIoT) provides enormous opportunities for the recognition of magnificent life. Nowadays, it is a rapidly developing technology. The Internet of Things (IIoT) has a significant impact on almost every sophisticated sector in society. It has a profound effect on both the person and the organization's way of life. As internet access becomes more widespread, the cost of connecting devices drops, allowing for the development of newer systems that use Wi-Fi. Connecting any gadget to the internet is known as the "IIoT" idea, and it will be the new law in future. For example, "automobiles, embedded devices, environmental monitoring, agriculture and construction, smart grids and health care" are all instances of how the Internet of Things may be used in many sectors. IIoT has made its way into practically every business, according to an assessment of current systems in the automotive industry, the emergency response system, including supply chain management.

[6] As artificial intelligence continues to advance, humans are headed toward an age in which all objects are connected intelligently. Consequently, the development of intelligent social applications has a dramatic impact on sensor demand. There is significant energy consumption for the equipment which is widely dispersed and functioning intermittently using traditional sensors, which is not favorable to building sustainable green & healthy applications. It is possible to collect energy from the surrounding environment and store it using self-powered sensors based on the "triboelectric nanogenerators" (TENG). "Smart cities, smart transportation, smart homes, environmental monitoring, wearable gadgets, as well as bio-medicine" all rely on sensors that are self-powered without the need for an external power

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source. TENG's operating mechanism and the development of “self-powered sensors” based on TENG in the “Internet of Things (IoT), human–computer interaction, robotics, and intelligent medical” domains are summarized in this article.

[7] For the supply of microservices, Docker containers are the most popular lightweight virtualization technique. Docker containers' scheduling on “cloud-fog/internet of things” (IoT) networks is addressed in this research. Firstly, the ease with which intelligent containers' schedulers based on soft-computing may be integrated into the leading open-source container management platforms: “Google Kubernetes, Docker Swarm, and Apache Mesos First of all”, there is a requirement for intelligent containers' schedulers for each of the three interfaces in cloud fog networks: “cloud to fog (C2F), cloud to cloud (C2F), and cloud to fog (C2F)”. Ultimately, we want to help millions of people utilize cloud-based micro services, like content delivery networks, smart health, especially smart health, to the best of their abilities. According to past studies and implementations, the improvement is analyzed in the terms of the “quality of service” (QoS) factors like latency, load balancing, energy usage, and runtime. And the scientific-technical ramifications of smart containers are also examined, indicating how new possibilities in research might effect market demand for smart containers.

[8] The “Internet of Things” (IoT) has become a groundbreaking approach that allows for a wide range of features and applications to be implemented. It is possible to link a wide range of devices to form a single communication architecture. Because of its rapid growth in recent years, it is imperative that this hot technology be thoroughly examined and examined in all of its many uses. People and objects will be able to communicate in new ways thanks to this technology. As a result of the formation of an entirely new world dimension, this notion has a huge impact. “Low-cost sensors, high-speed as well as error-tolerant data connections, clever calculations, and a wide range of applications” are essential for implementing a large-scale Internet of Things (IoT). Among the four major elements of this study are a basic overview of IoT technology, a review of the key IoT applications, and a section on the problems of IoT. The goal of this research is to cover all of the IoT applications , including healthcare, commercial, environmental, industrial, smart cities, as well as infrastructure. As a response to the issues raised by the Internet of Things, this paper offers a next-generation protocol as a means of resolving them. For the advancement of R&D. in the sectors, IoT problems were examined. There is an emphasis on emphasizing probable future research concerns and outstanding issues for the IoT applications to guarantee a complete overview of the articles presented in this article.

[9] Predatory journals as well as publishers are becoming an increasing problem in the academic publishing sector.. Numerous people, organizations, and businesses have started compiling journal watchlists or safelists in an effort to solve this increasingly critical problem. These lists, as well as the wider debates surrounding predatory publishing, are examined using a qualitative content analysis to get a deeper understanding of their content and inclusion/exclusion criteria indicated by watchlists and safelists maintained by scientific publishing journals. The stated goal statements as well as inclusion/exclusion criteria of four watchlists and ten safelists were examined. For the safelists, librarian Jeffrey Beall has remained influential, but his methods have been explicitly disavowed, and there is

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growing recognition that the "list" approach could not fully address the systemic aspects of the predatory publishing which go beyond the "ethical decision-making" authority of individual authors. This is an important difference.

[10] The "Internet of Things" (IoT) is a concept that describes a vision of a world where everything is linked to the internet. Industries like healthcare as well as socially responsible goods, industrial automation, and energy management have all benefited greatly from IoT applications. Assuming this scenario holds true, there are already more than 14 billion digital as well as electrical gadgets linked to the internet throughout the globe, or around two devices for every person on the planet. The Internet of Things (IoT) allows non-living items to communicate with each other and with the rest of the world through the internet, automating routine tasks and making life easier for everyone. As a result, internet connection and advanced data processing capabilities are being added to everyday things, which have the potential to transform the way we live and work. The Internet is a global network of linked computer networks that utilise the TCP/IP standard to service billions of people across the globe. Connectivity, connectivity, active engagement, sensors, artificial intelligence, as well as tiny device utilization are the most important elements of IoT. There is an in-depth examination of the Internet of Things (IoT) in this article, including an overview, technical specifics, plus applications in this newly developing field. This publication, on the other hand, can help young scholars interested in the Internet of Things sector better grasp.

[11] As a booster for children aged 3–4 years old, the researchers evaluated the "immunogenicity and safety of dTap-IPVB (Boostrix-IPV, GSK) with dTap-IPVR (Repevax, Sanofi Pasteur), when given with mumps-measles-rubella vaccine (MMRV)". It took place in the UK between April 2011 and April 2012 for this phase III open label randomized research. To test the vaccine's immunogenicity, blood samples were collected soon before and one month after the children were vaccinated with either the dTap-IPVB or the dTap-IPVR vaccine, which were administered in a 2:1 randomization. Study vaccinations were compared based on "immune responses to antigens for diphtheria, tetanus, and polio (inferential comparison)". In the absence of a recognized correlate of "protection against pertussis, the immunogenicity of the "dTap-IPVB vaccine" was compared to historical effectiveness data for pertussis" (inferential comparison). It was determined whether or not both vaccinations in the trial were safe and reactogenic. A total of 387 children were randomized and 385 vaccinated: 255 in the "dTap-IPVB" group and 130 in the dTap-IPVR group. Sixty-six percent of children had anti-diphtheria titres over the protection threshold prior to vaccination, whereas sixty-five percent had "anti-tetanus titres" above the protection threshold prior to the introduction of the pertussis vaccine. A total of 99.2–100 percent of children achieved seroprotection/seropositivity levels with both vaccinations. To far, there have been no reports of any major adverse events that were not judged to be directly linked to vaccination. The results show that dTap-IPVB is not inferior than dTap-IPVR. MMRV and both vaccinations were safe and effective when given to children between the ages of three and four, according to a new study.

WORKING OF AN IOT

They use embedded devices, including as sensors and processors, which are linked to the internet and use that data to gather, transmit or reply in some other manner. IoT devices can share sensor data by connecting to an IoT gateway or another edge device, and this data may subsequently be reviewed in the cloud or on-site. These devices are capable of sharing data as well as taking action based on the information they get from other devices. In spite of the fact that people may interact with the gadgets (for instance, to set them up, or retrieve the data or give them instructions), the gadgets conduct the bulk of the work on their own.

Depending on the exact IoT applications, these web-enabled devices have different connection, networking, as well as communication protocols. AI as well as “machine learning” may also be used to make data collection procedures simpler and more dynamic in the “Internet of Things” (IoT).

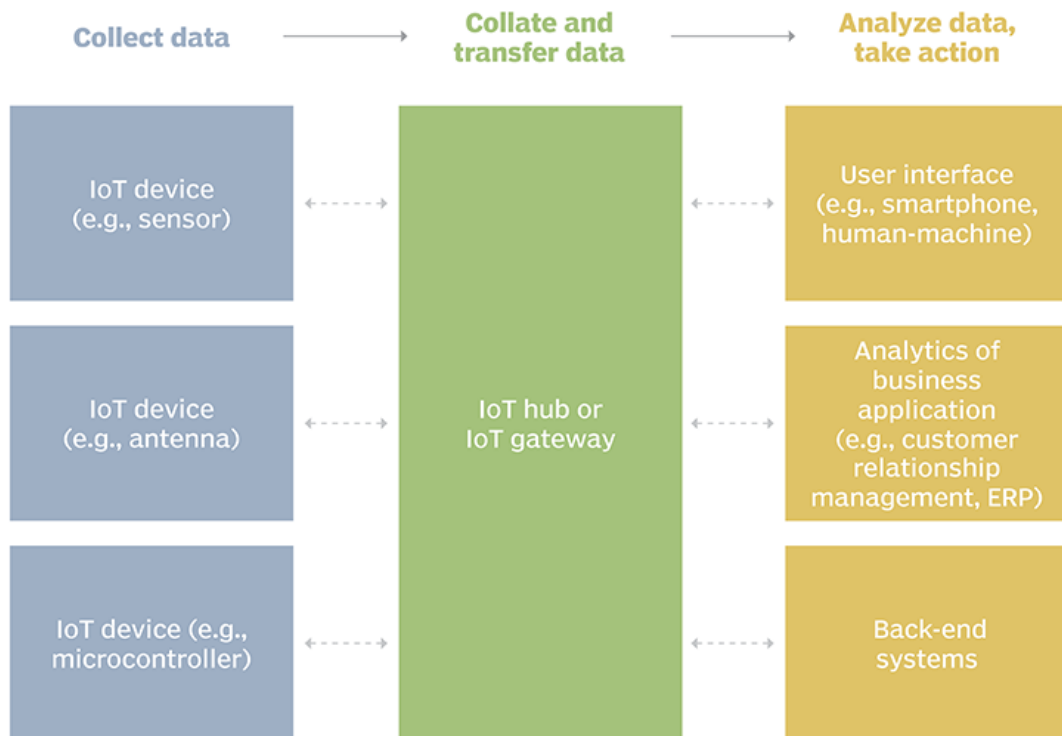


Figure 58 Example of an IOT System

The “Internet of Things” (IoT) has been around for a long time, but recent technological advancements have made it a reality.

- **“Access to low-cost, low-power sensor technology”.** More manufacturers may now use IoT because of the availability of low-cost, high-quality sensors.

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- **“Connectivity”**. More manufacturers may now use IoT because of the availability of low-cost, high-quality sensors.
- **“Cloud computing platforms”**. Businesses and individuals may now get the infrastructure they need to grow without having to manage it all thanks to the growing availability of cloud platforms [12].
- **“Machine learning and analytics”**. Machine learning as well as analytics, as well as access to a wide range of data stored in the cloud, have made it easier and quicker for organisations to get insights. As these related technologies continue to develop, the IoT data created by these technologies also feeds them.
- **“Conversational artificial intelligence (AI)”**. “Natural language processing” (NLP) has been brought to IoT devices (like digital personal assistants Alexa, Cortanna, or Siri) thanks to advancements in neural networks.

People may take back control of their life and work with the aid of the “internet of things”. The “Internet of Things” (IoT) [13] is not only a home automation tool, but a commercial need as well. An organization's systems may be monitored in real time, from the operation of equipment to the supply chain and also logistics, using the Internet of Things.

Because of the “Internet of Things”, businesses may streamline operations and save personnel expenses. Reduced production and delivery costs and improved customer contact transparency are the end results of these approaches. The Internet of Things (IoT) will continue to gain pace as more firms realize the advantages of employing connected devices in their day-to-day operations.

APPLICATIONS OF IOT

1. Wearables.

Wearable gadgets, such as fitness bands, virtual glasses, as well as GPS tracking belts, have been around for a while now and have been used by many people. The Internet of Things as well as its applications have been created and implemented by companies like google, Samsung, Apple, and others. With sensors and the appropriate hardware for the measurements including readings and software that collects information on users, these gadgets are compact yet efficient.

2. Health.

Doctors may keep tabs on a patient's condition both inside and outside of hospital with the use of wearables as well as sensors linked to the patient. It is possible to improve patient care and prevent fatalities in high-risk patients by continually monitoring certain metrics and providing automated alerts on their vital signs through the Internet of Things (IoT) [14]. Smart beds fitted with sensors to monitor vital indicators, such as oximeter, blood pressure, and body temperature, are another usage of IoT technology.

3. Traffic monitoring.

Car traffic management in major cities may be greatly improved with the use of the “Internet of Things” (IoT). Waze as well as Google Maps, for example, use mobile phones as sensors to collect as well as share the data from the vehicles, allowing us to monitor the traffic conditions as well as feed and improve information on the different routes to the same destination, distance as well as the estimated arrival times.

4. Fleet management.

Vehicle managers and drivers benefit from the installation of the sensors in fleet cars, which facilitates optimal interconnectivity. Both the driver and the manager/owner of the vehicle have access to the software that collects, processes, and organizes the data regarding the vehicle's state, operation, and requirements. Even if the driver isn't aware of a problem, the system will notify them in real time. A fleet management system that utilizes the Internet of Things can assist in the performance analysis, geolocation, telemetry control as well as fuel savings, as well as the reduction of harmful emissions to environment. It may even be able to provide the information that can help drivers improve their performance on the road.

5. Agriculture.

It is a reality that modern farms are intelligent. Farmers may use the Internet of Things to get vital information on the health of their soil, which is essential to producing high-quality crops. Using IoT sensors, a great deal of information may be gleaned about soil conditions and stages. There are various chemical properties that may be used to assist farmers regulate irrigation as well as make water usage more effective as well as determine the ideal time of year for planting as well as the presence of plant and soil diseases.

6. Hospitality.

The use of IoT in the hotel business has the potential to enhance the level of customer service. Automated interactions may be achieved by using electronic keys, which can be supplied immediately to the mobile devices of each visitor. For example, Internet of Things apps may be used to track the position of visitors, convey offers and information about nearby attractions, process orders for in-room service, charge guest accounts automatically, and request personal hygiene supplies. Using electronic keys, the check-out procedure may be automated, preventing doors from opening, providing information about the rooms currently available, and even assigning cleaning jobs to maintenance staff.

7. Smart grid and energy saving.

In order to better monitor and manage the electrical network, the usage of intelligent energy meters, or meters fitted with sensors, and also sensors at key locations along the supply chain have become more prevalent. The establishment of an open line of communication between “the service provider and the end user” is vital for the identification of problems, decision-making, and correction. For the end-user, it provides a wealth of information on how to reduce or alter their energy use.

8. Water supply.

An Internet-connected sensor, along with the necessary software and either built into or attached to water meters can help gather, process, and analyses data in order to better understand consumer behavior and identify problems with the supply service. This data can then be reported to the company that provides the service, who can then take appropriate action. Customers may watch their own consumption statistics through a web page as well as in real time, even getting automated notifications if their consumption is out of line with their usual use record, which might suggest a leak.

9. Maintenance management.

Maintenance management is one of the most common uses of Internet of Things (IoT) technology. In order to increase the usable life of physical assets while ensuring asset dependability as well as availability, sensors and CMMS/EAM maintenance management software are combined to create a versatile solution. This tool may be used across several disciplines and practices.

It is almost difficult to limit the uses of software that processes and organizes sensor data to satisfy the needs of physical asset maintenance management. As a result of real-time monitoring of the physical assets, "condition-based maintenance" (CBM), as well as "AI technologies like Machine Learning and Deep Learning", may be used to predict failure before it happens.

CONCLUSION

IoT applications have been deeply ingrained in our daily lives and businesses as a result of technological advancements such as digital transformation, quicker connection, and advances in machine learning as well as artificial intelligence. The Internet of Things (IoT) is constantly iterating, improving, and expanding. As opposed to pre-built networks, these networks develop throughout time. Hardware and software have been integrated into the Internet of Things (IoT) to create a smarter world. Government and industry have a wide range of options to take advantage of its rapid expansion. It's really at an all-time high in the number of job postings for IoT specialists.

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