ISSN–2277- 8721

EIIRJ Electronic International Interdisciplinary Research Journal

Volume–XII, Issues – IV July – August 2023

OPEN ACCESS Original Research Article

THE ROLE OF INTERNET OF THINGS(IOT) IN SMART HEALTHCARE SYSTEM

Patil Pragati Prashant

Student at the Department of Computer Science at Sarhad College of Arts, Commerce, and Science in Katraj, Pune

Doifode Sonali Pandurang

Research Scholar, Department of Computer Science, Shri JJT University, Rajasthan

Abstract:

Healthcare has evolved thanks to the Internet of Things (IoT) revolution. Health management has replaced treatment as the primary focus of healthcare. As a result, as healthcare develops toward patient-oriented and analytical applications, more data are being collected and pooled than ever before. In addition to discussing health data and patient-centred health management, this article also covers several facets of smart healthcare. One of the most important industries that the Internet of Things (IoT) has modernized is healthcare. The ability to collect data and evaluate this enormous data is made possible by the shrinking of sensors. IoT sensors can be used to connect medical equipment and resources in order to gather data and process it. This paper provides a overview of certain IoT's effects on the healthcare industry. Healthcare cannot be outside of this paradigm given the rise of IoT technologies. The purpose of this article is to provide guidelines for achieving worldwide connectivity between medical environments and the Internet of Things (IoT).

Keywords: *Internet of Things (IoT), Healthcare, Medical Environments, Sensors.*

Introduction:

The term "IoT smart healthcare" refers to a collection of wearable and non-wearable healthcare monitoring devices that are used to continually monitor patients' health conditions. The IoT healthcare gadgets are wirelessly connected and have the ability to send reports to the appropriate hospitals. Hospitals and insurance firms can gain greatly from IoT applications in healthcare. Heart rate monitoring, remote patient monitoring, connected inhalers, blood pressure monitoring, illness monitoring, and glucose level monitoring are a few examples of healthcare monitoring devices. Utilizing IoT technologies in smart healthcare improves the efficiency of patient care and raises the rate of surveillance. In addition, it helps doctors diagnose illnesses quickly, diagnose patients remotely, save down on travel time, and treat patients promptly.

Smart healthcare technologies can anticipate future diseases and shield people from death. Additionally, it reduces medical visit fees and provides reasonably priced testing fees. IoT technology has many uses in the healthcare industry, including remote monitoring, smart sensors, and medical device integration. It increases how well doctors provide care to patients and keeps patients safe and healthy.IoT technology has many uses in the healthcare industry, including remote monitoring, smart sensors, and medical device integration. It increases how well doctors provide care to patients and

ISSN–2277- 8721

EIIRJ Electronic International Interdisciplinary Research Journal

Volume–XII, Issues – IV July – August 2023

OPEN ACCESS Original Research Article

keeps patients safe and healthy.

The medical business is being transformed by the Internet of Things (IoT), a revolutionary technology movement that uses interconnected devices and sensors. IoT enables healthcare providers to improve patient care, operational efficiency, and overall healthcare outcomes by seamlessly integrating data from diverse sources. Devices like wearable fitness trackers, intelligent medical equipment, and remote monitoring systems gather real-time patient data, such as vital signs, medication adherence, and activity levels, in IoT healthcare applications. In order to help healthcare professionals make wise choices and deliver prompt solutions, this data is then securely communicated to them.

IoT technology is essential for telemedicine since it allows for remote patient monitoring and virtual consultations. This has grown to be especially crucial for enhancing access to healthcare services, especially in isolated or underserved locations. IoT also improves hospital management through resource allocation optimization, equipment status monitoring, and increased facility productivity. Given the sensitivity of patient data, security and privacy issues are crucial factors to take into account when implementing IoT in healthcare. In conclusion, IoT in healthcare has the potential to completely transform patient care, remote monitoring, and healthcare administration, ultimately resulting in improved outcomes and greater accessibility to healthcare services.

Research on the Internet of Things is still in its infancy, and its potential applications for healthcare are also still in their infancy. The Internet of Things is examined in this section, and its applicability to healthcare is underlined. Several engineering projects aimed at creating IoT solutions for healthcare are addressed. A generic and standardized model for a future end-to-end IoT healthcare system is provided with the purpose of directing the development of such System, building on the recurrent themes from prior works.

Literature Review:

According to the author Aitizaz Ali et al., (2022) the IoT and its suggested structure give the healthcare sector improved security and searching capabilities.

Huda Hussein Mohamad Jawad et al., (2022) finds that over the past ten years, the Internet of Things is completely changed how we use technology. Because of how quickly the internet of things is developing, particularly in the healthcare industry, smart healthcare or HIoT, promises to improve people's life and welfare by keeping an eye on them, providing effective connections, enhancing mobility, etc.

Rajkumar Rajavel et al., (2021) said that IoT can add sturdiness and intelligence to the monitoring of patient monitoring for distant patients and events in smart healthcare applications.

According to the literature **of Amine Rghioui, Jaime Llore and Abedlmajid oumnad (2020)**, IoT big data's usage in healthcare is a work in progress, and future work will be made simpler as the IoT is integrated into the healthcare system.

Mohammad Tarbez Quasim et al., (2019) finds that the hardware requirements, problems, and complexity for detection and checking purposes are the focus of the internet of things and health care.

Shubham Banka et al., (2018) said that Internet of Things for healthcare is a crucial component of offering patients greater medical facilities as well as amenities for physicians and hospitals.

V. M. Rohokale et al., (2011) said that the Internet of Things (IoT) is a network of physical things that have sensors, other technology, and software incorporated in them.

Objectives:

- Monitoring and Simultaneous Reporting
- Affordability
- End to End Connectivity

ISSN–2277- 8721

EIIRJ Electronic International Interdisciplinary Research Journal

Volume–XII, Issues – IV July – August 2023

OPEN ACCESS Original Research Article

- Data Assortment and Analysis
- Alerting and Tracking

Internet of Things (IoT): The Auto-ID Centre at the Massachusetts Institute of Technology (MIT) conducted research that helped popularize the phrase "Internet of Things" in 1999. The Internet of Things (IoT) comprises the ideas of "Internet" and "Thing," where "Internet" refers to "The global network of interconnected computer networks" and "Thing" refers to "an object not precisely identifiable." These ideas imply that every thing can act in a smart area, such as a medical setting, and can be addressed by an IP (Internet Protocol).

The network of physical objects-"things" that are integrated with sensors, software, and other technologies for the purpose of communicating and sharing data with other devices and systems over the internet is referred to as the Internet of Things (IoT).

The Internet of Things (IoT) is also described as "a self-configured dynamic global network infrastructure with standards and interoperable communication protocols where physical and virtual "things" have identities, physical characteristics, and virtual personalities and are seamlessly integrated into the information infrastructure. In fact, the Internet of Things (IoT) is the global network formed by connecting smart objects through extended Internet technologies, the collection of enabling technologies required to realize such a vision such as RFIDs, sensor/actuators, machine-to-machine communication devices, etc.

The collection of applications and services utilizing these technologies to create new business and market opportunities. The following list summarizes the core attributes of IoT technology:

- a real-time solution in a worldwide setting.
- primarily wireless solutions for indoor and outdoor settings.
- capacity for remote environment monitoring and object tracking.

Figure 1 IOT

Healthcare:

Healthcare is a top priority for all governments. It is primarily affected by population growth, rural urbanization, declining birth-rates, population aging, economic growth, and socially unbalanced resource utilization. A number of social problems have emerged in the healthcare sector that IoT may help to prevent or combat most effectively include the following:

- the inability to handle emergencies and the level of health management.
- A serious shortage of medical professionals and institutional resources, particularly in rural areas.
- a lack of medical facilities.
- a low standard of care; an inadequate healthcare system.
- an ineffective system for preventing diseases that cannot meet the needs of the national strategy to protect the public's health and places a significant burden on the economy, people, families, and the State.
- Inadequate capabilities for disease prevention and early detection.

However, there are several issues that IoT can assist with:

- transcend regional boundaries by offering quick clinical responses.
- connections for medical picture and video data transmission and consultation.

ISSN–2277- 8721

EIIRJ Electronic International Interdisciplinary Research Journal

Volume–XII, Issues – IV July – August 2023

OPEN ACCESS Original Research Article

- an exclusive ontology for everything in IoT-based healthcare.

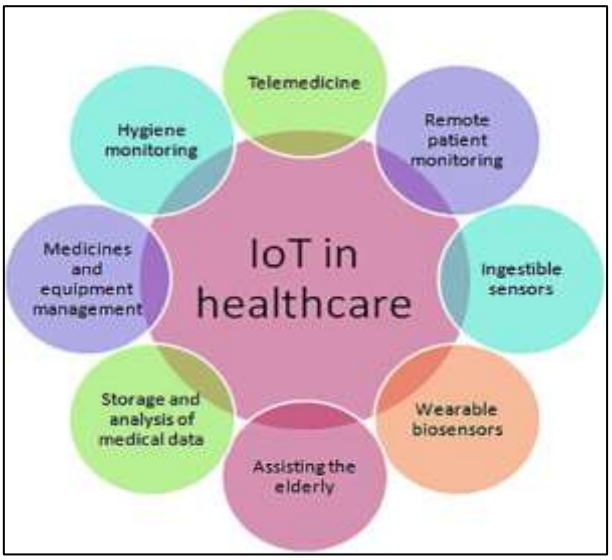


Figure 2 IOT in Healthcare

There are several uses for smartphones in the healthcare industry, including the potential to use them as an interface for monitoring medical indicators that alert people to medical problems.

Healthcare and technologies:

The Internet of Things (IoT) is transforming the healthcare industry through its numerous applications. IoT's increased influence in healthcare will be advantageous to both patients and professionals. Mobile medical applications and wearables that let people record their health data are some examples of how the Internet of Things in healthcare is used. IoT is used by hospitals to track the whereabouts of patients, staff, and medical equipment. The technologies that can be used with IoT-based healthcare systems are listed below:

Cloud Computing:

Healthcare facilities should have constant access to shared resources, be able to deliver services on demand across the network, and be able to carry out operations to the insertion of cloud computing in IoT-based healthcare technology.

Grid Computing: Because non-invasive sensing and lightweight wireless networks have made it possible to continuously monitor and process mobile patients using biomedical sensor nodes, the idea of grid computing may be extended to IoT. These tiny wearable gadgets, which have limited energy, memory, computing, and communication capabilities, may continually monitor vital indicators including blood pressure, temperature, oxygen saturation, electrocardiograms, and electromyograms.

Big Data:

To boost the effectiveness of pertinent health diagnostic and monitoring techniques and stages, all data produced by medical sensors in the medical environment must be analysed.

Wearables:

Accepting medical devices that are wearable as benchmarks can help enhance population health and patient involvement. Connected information, target-oriented healthcare networks, and Gamication are three key advantages.

Healthcare Security:

The Internet of Things (IoT) is revolutionizing healthcare. Security, however, is a problem for corporate technology and clinical engineering. Additionally, these smart gadgets may be linked to international information networks to provide for 24/7 access. As a result, hackers might have their sights set on the IoT healthcare arena. It is crucial to identify and assess specific aspects of IoT privacy and security, including security needs, vulnerabilities, danger models, and defensive measures, from a healthcare viewpoint in order to promote the complete adoption of IoT in the healthcare system.

IoT Healthcare Services and Applications:

IoT healthcare services and applications include a wide variety of areas, such as managing personal health and fitness, caring for children, monitoring chronic illnesses, and caring for elderly people, among others.

ISSN–2277- 8721

EIIRJ Electronic International Interdisciplinary Research Journal

Volume–XII, Issues – IV July – August 2023

OPEN ACCESS Original Research Article

This article divides the material into two categories for easier comprehension: services and applications.

Healthcare Services:

- Wearable Device Access
- Ambient Assisted Living
- m-IoT (m-Health Things)
- Adverse Drug Reaction
- Public Healthcare
- Wearable Device Access
- Semantic Medical Access
- Early Prevention

Healthcare Applications:

Electrocardiogram Monitoring:

30% of all fatalities, according to research, are caused by issues with the circulatory system, such as arrhythmias, myocardial ischaemia, or extended QT intervals. This highlights the significance of electrocardiogram (ECG) monitoring of our vital signs. Electrocardiography records the electrical signals of the heart and includes measurements of heart rate and timing in addition to the diagnosis of cardiac arrhythmia ,ischemia of the myocardium, . In fact, IoT-based ECG monitoring applications have the ability to provide the most information and provide information to medical professionals.

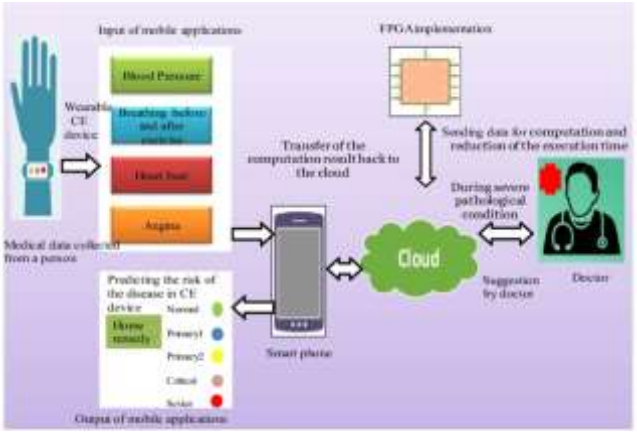
Diabetes Prevention:

A metabolic condition with numerous etymologies known as "diabetes mellitus" is defined by persistent hyperglycaemia and disturbances in carbohydrate, lipid, and protein metabolism brought on by errors in the production or action of insulin, or both. Numerous organs might suffer long-term harm, malfunction, and failure as a result of diabetes mellitus. Blood glucose monitoring can reduce all the problems that this condition may provide to patients by tracking unique blood glucose patterns and assisting patients in scheduling meals, activities, and medication times.

Wheelchair Management:

IoT is responding with smart wheelchairs for disabled persons that are fully automated, much like how work is moving more quickly.

Figure 3 The Process Flow of the IoT Based Smart Healthcare System



Blood Pressure Monitoring:

The human body maintains homeostasis to keep systems in balance or bring them back to normal operating ranges, such body temperature, by controlling a wide variety of extremely complicated interactions. Because the temperature of the body is a crucial critical indicator, monitoring this variable is an integral aspect of healthcare services.

The ability to retrieve body temperature fluctuations and report them to a system for temperature tracking through a home gateway through the Internet of Things is made possible by using a thermal sensor that is being tested that is integrated into a TelosB device.

Oxygen Saturation Monitoring:

A non-invasive and continuous monitoring device called pulse oximetry can be used to detect blood oxygen saturation. Monitoring of oxygen saturation can be facilitated by the incorporation of a pulse oximeter into an Internet of Things application.

Medication Management:

The medicine poses is one of the major issues in the health sector and a significant cost burden. IoT guarantees an innovative way to address this problem.

Conclusion: The healthcare sector was altered by the

ISSN–2277- 8721

EIIRJ Electronic International Interdisciplinary Research Journal

Volume–XII, Issues – IV July – August 2023

OPEN ACCESS Original Research Article

Internet of Things, which raised productivity, reduced expenses, and refocused attention on providing better patient care. The Internet of Things, meanwhile, is expanding from the tiniest sensors to the foundational elements of automation and communication between machines. We also take into account how IoT may be utilized to enhance healthcare and how it can assist citizens and governments in enhancing daily activities on both a private and public level. Giving out location data has security drawbacks, but we can nevertheless offer users some latitude in order to provide safeguards against abuse. To fully utilize this IoT technology, however, there are still many tasks to be completed. In the future, we must expand these applications to achieve the required. People now view healthcare and industry systems differently because to IoT. By implementing such little modifications, the acceptance of such technologies will enhance product development and have a long-term impact. Devices that regularly measure health biometrics or accurate health-related data are examples of how modern technologies are quickly becoming beneficial in the healthcare industry. Healthcare practitioners and patients are embracing mobile applications to manage their health thanks to Internet technology and widespread smartphone use. In this type of healthcare setting, combining IoT methods with large data is essential. IoT is transforming healthcare delivery by establishing a platform for communication between various health sectors, offering digital assistance at every step, and accelerating the adaptation of contemporary medicine to the needs of the moment. These cutting-edge healthcare systems might deliver the correct information on appropriate patients at the right time to healthcare providers. The Internet of Things (IoT), which has improved operational effectiveness and enabled remote monitoring, has had a huge influence on the healthcare sector. It has made it possible to follow a patient's vitals in real-time, expedited the data collecting process, and provided healthcare personnel with insightful knowledge. However, issues like security of data and privacy worries continue to exist. IoT has the potential to further alter healthcare as it develops, but for its integration to be effective, thorough consideration to moral and technological issues is essential.

References:

Ali A, Almaiah MA, Hajjej F, Pasha MF, Fang OH, Khan R, Teo J, Zakarya M. An Industrial IoT-Based Blockchain-Enabled Secure Searchable Encryption Approach for Healthcare Systems Using Neural Network. *Sensors*. 2022; 22(2):572. https://doi.org/10.3390/s22020572

Rajkumar Rajavel, Sathish Kumar Ravichandran, Karthikeyan Harimoorthy, Partheeban Nagappan & Kanagachidambaresan Ramasubramanian GobichettipalayamVitor Nogueira (2021):An overview of IoT and Healthcare.

Amine Rghioui, Jaime Llore and Abedlmajid Oumnad (2020): Big Data Classification and Internet of Things in Healthcare

Mohammad Tabrez Quasim, Mohammad Ayoub Khan, Monir Abdullah, Mohammad Meraj, S P Singh, P. Johri (2019): Internet of Things for Smart Healthcare:A Hardware Perspective

Vitor Nogueira (2019): An Overview of IoT and Healthcare.

Cite This Article:

Patil P.P. & **Doifode S.P. (2023).** *The Role of Internet of Things(Iot) in Smart Healthcare System*, **Electronic International Interdisciplinary Research Journal**, *XII, Issues – IV, July -August, 2023*, **74-79.