iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 14 **Issue:** V **Month of publication:** May 2026

DOI: https://doi.org/10.22214/ijraset.2026.82217

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 14 Issue V May 2026- Available at www.ijraset.com

Role of Internet of Things (IoT) in Healthcare System

Aarti Rani[1], Dharmendra Singh[2]
Department of Computer Science & Engineering, Babu Sunder Singh Institute of Technology & Management (AKTU), Uttar Pradesh, India

Abstract: ***The premature death of people as a result of inadequate medical care is a major issue. Furthermore, the number of senior citizens in need of ongoing care is rising. The future viability of traditional healthcare systems is threatened by the world's aging population. The Internet of Things (IoT) and communication technologies have advanced remarkably in recent years, and the significance of artificial intelligence (AI) explainability and information fusion has grown. As a result, creating IoT-based and revolutionary healthcare systems is essential. This would create new opportunities for smart and effective healthcare systems. Internet of Things (IoT) technology integration in the healthcare sector is a revolutionary change with observable advantages. The foreseeable future of healthcare can be greatly improved with smart healthcare systems, offering better treatment, more effective patient care, and higher-quality care. The goal of this study is to present a thorough analysis of the major cutting-edge and enabling innovations for smart healthcare systems.***
Keywords: Internet of Things in Healthcare, IoT Sensors, IoT Technologies in healthcare.

I. INTRODUCTION

Traditional healthcare systems are becoming unsustainable and inadequate due to the world's population expansion and the rising number of elderly and chronically ill patients. In addition, hospitalization and patient care are becoming more and more in demand globally. As a result, it becomes crucial to give patients high-quality care while cutting healthcare expenses. Access to a dependable healthcare system and remote patient monitoring (RPM) are still problems in distant places. As a result, traditional healthcare systems are finding it difficult to keep up with the increasing demand for prompt and effective medical care, which is creating serious problems like delayed treatments, improper medicine, and mistakes in the treatment of several illnesses, particularly infectious diseases. In particular, these continuing demands and requirements for healthcare are unlikely to be met by the current healthcare systems. Healthcare systems must be intelligent, effectively managed, and sustainable in order to meet these expectations [1]. This has created a pressing need to transform healthcare systems, where smart healthcare becomes essential. The use of gadgets and communication technology from the Internet of Things (IoT) has advanced significantly in recent years, potentially altering how we engage with our environment [2]. The Internet of Things (IoT) is a network of physical devices that may be linked together over the Internet to exchange information and communicate. IoT specifically makes it possible for physical objects to communicate and exchange information, which enables them to perceive, interact, and carry out a variety of functions [3]. The Internet of Things, or IoT for short, is a cutting-edge and quickly developing technology that has the potential to transform how we interact with our environment. Over 75 billion connected devices are predicted to exist globally by 2025. One sector that is anticipated to gain a lot from this expansion is the healthcare sector [4, 5,6]. Wearable fitness trackers, remote patient monitoring devices, smart hospital beds, and connected medical gadgets are just a few of the various uses of IoT technologies in healthcare. These tools transform patient interactions, real-time health state monitoring, and decision-making for healthcare professionals. IoT use in healthcare has been rising rapidly, and the market is anticipated to rise significantly in the upcoming years [7]. It is impossible to exaggerate the importance of IoT in healthcare. By improving illness management, facilitating remote care, and increasing patient participation, its applications have the potential to completely change the healthcare sector. IoT technology enable ongoing patient health monitoring, enabling prompt actions and early identification of possible health problems. This capacity is especially important for managing long-term illnesses including diabetes, heart disease, and respiratory problems, where patient outcomes can be greatly impacted by routine monitoring [8]. Additionally, by optimizing resource allocation, cutting expenses, and simplifying procedures, IoT applications in healthcare improve operational efficiency. For example, IoT-enabled asset tracking can help hospitals better manage their equipment, reducing losses and guaranteeing that essential instruments are on hand when needed. Furthermore, evidence-based decision-making can be informed by the gathering and analysing of data from IoT devices, resulting in more individualized and successful treatment regimens.

©IJRASET: All Rights are Reserved

A more effective, flexible, and patient-focused healthcare system could result from integrating IoT technologies. This study attempts to demonstrate the critical role of IoT in influencing the future of healthcare delivery and results by looking at the use cases and advantages of IoT in healthcare [9].

II. IoT TECHNOLOGIES IN HEALTHCARE

Significant growth is a result of IoT's revolutionary potential in healthcare, its demonstrable advantages to patients, and the general digital transformation taking place in the medical sector. IoT, sometimes known as the internet of medical things (IoMT), encompasses a number of technologies used in the healthcare industry, including sensors that gather biometric data from patients, networks that transfer data, and computers that process the data. When those technologies are combined in an Internet of Things setting, patients and their healthcare practitioners may analyse and react to data almost instantly. Without that technology, this would not have been conceivable in terms of accuracy and speed. Healthcare Internet of Things (IoT) sensors continuously gather and send data to centralized systems over wireless networks from a variety of medical devices, settings, and patients. They keep an eye on equipment functioning, ambient conditions, patient health, and other critical data.

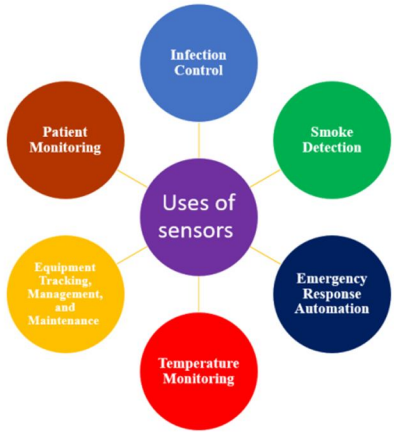


Fig1: Uses of Sensors

IoT Sensors Used in Healthcare	
Wearable Sensors	Vital indicators including heart rate, blood pressure, and oxygen levels can be tracked using wearable sensors that are affixed to a patient's body. These sensors can notify medical staff of any unexpected changes in a patient's condition and offer real-time data. Smart watches and fitness trackers are two examples of wearable sensors.
Environmental Sensors	Environmental sensors keep an eye on things like motion, humidity, temperature, and air quality in medical environments. These sensors can identify any risks and contribute to the upkeep of a secure and comfortable patient environment. **Temperature Sensors** – These sensors monitor temperature levels in refrigerators, freezers, and other storage units where medications and vaccines are stored. **Humidity Sensors** – With a humidity sensor, you can measure the amount of moisture in the air. In healthcare settings, they can prevent mold growth and maintain safe patient conditions. **Air Quality Sensors** – Air quality sensors monitor pollutants, particulate matter, and other harmful substances in the air. These sensors can help improve patient outcomes by alerting healthcare professionals of any potential respiratory risks.
Motion Sensors	Motion sensors are able to identify movement and provide information about the degree of patient activity. To track a patient's physical movements and spot possible problems, they are frequently utilized in remote patient monitoring systems. Accelerometers and pressure mats are two types of motion sensors.
Asset Tracking Sensors	Asset tracking devices keep an eye on medical supplies and equipment in hospitals. These sensors can monitor equipment locations, guarantee appropriate maintenance plans, and guard against loss or theft. Healthcare professionals can report potential problems and concerns before they worsen by using these.
Level Sensors	Level sensors keep an eye on the amounts of liquids in storage containers, including blood products and pharmaceuticals. They aid in preventing these containers from being overfilled or under filled, guaranteeing precise patient dosing. Water tanks, septic tanks, and similar containers can also be utilized with them.
Electrocardiogram, Pulse Oximeter, Blood Pressure, Glucose, Temperature, Respiratory	

Fig2: Types of Sensors used in healthcare

A. IoT Applications

IoT is used by healthcare organizations in a variety of ways to enhance clinical operations, patient outcomes, and patient experiences. These are some important IoT applications in the medical field [10].

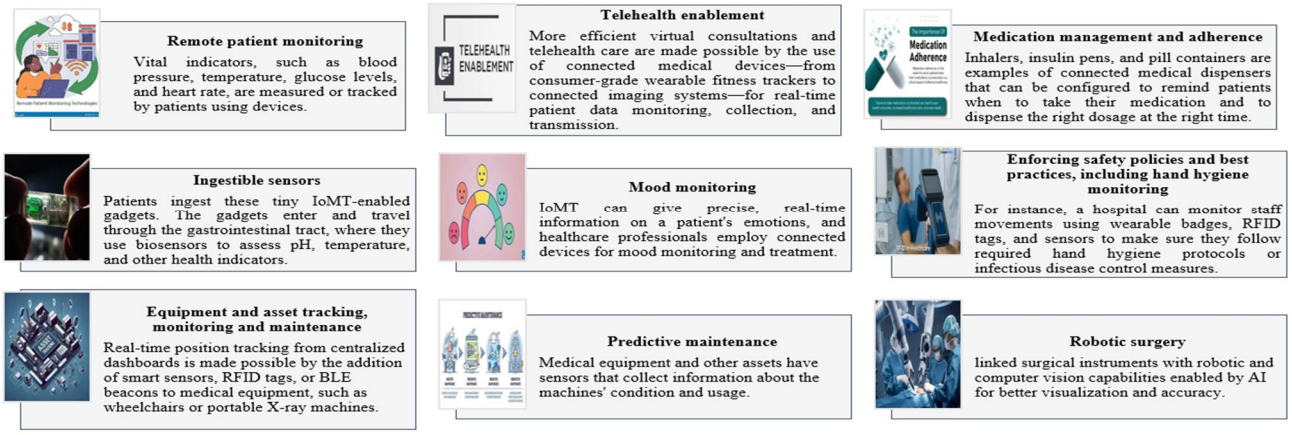


Fig 3: IoT applications in Healthcare

B. IoT communication Technologies

IoT communication technologies, exploring the different wired and wireless choices that allow devices to securely and effectively interact.

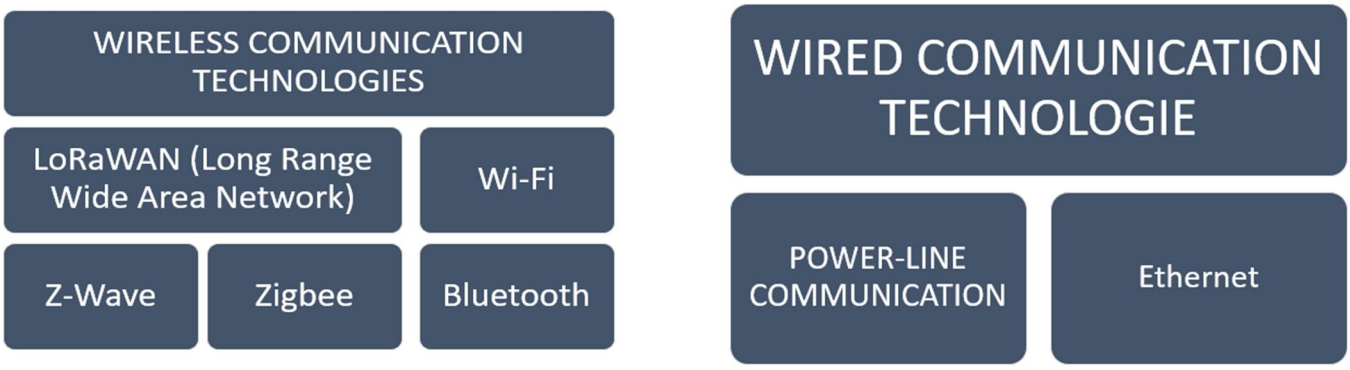


Fig 4: Communication Technologies

III. RELATED WORK

IoT applications in healthcare are numerous and include disease management, well-being, and assistance for independent living. IoT healthcare also seeks to help consumers manage their diseases by connecting and interacting with medical professionals. IoT is making daily life easier by making routine chores easier. The Internet of Things has numerous practical applications in industries such as mining, healthcare, energy, intelligent cities, agriculture, and transportation [11].

Islam, Kwak[12] studied the latest advances in IoT-based healthcare technologies, network applications, architectures/platforms, and commercial trends in IoT-based healthcare solutions. Additionally, they looked at a number of IoT security and privacy aspects from the perspective of the healthcare sector, including security standards, threat models, and attack taxonomies. Additionally, they proposed an intelligent collaborative security paradigm to lower security risk. They discussed the potential applications of numerous technological developments in the healthcare sector, including wearables, ambient intelligence, and big data. Nuscheler and Engelen[13] talked about the use of IoT in the healthcare system, the issues with IoT in the healthcare system, and a review of many studies in this area that looked at a proposed method. Alshehri and Muhammad [14] conducted a thorough analysis of edge-intelligent smart healthcare based on IoT and IoMT, focusing on journal articles published between 2014 and 2020. They examined a wide range of research topics, including edge and cloud computing, IoT and IoMT, AI, security, and signals related to medicine fusion. Tuli, Tuli[15] conducted a methodical study of IoT-based intelligent healthcare solutions. Many innovative technologies and

their applications were covered in their article. Their study reflected the fundamental platform, topology, and design of the intelligent healthcare network. Health care implementation requires the use of the Internet of Things. Rananga and Venter [16] focused on technologies, implementations, risks, opportunities, open-source networks, and operating systems as they investigated the most recent IoT architectures for improved living spaces and healthcare systems. In order to address various healthcare application difficulties, such as patient control, smart hospitals, and remote medical services, Dadhich[17] carried out a comprehensive review of the most recent literature on cloud computing and IoT convergence. Additionally, a brief overview of IoT and cloud computing with a healthcare application was given. Aloqaily and Hayyolalam [18] examined edge-assisted IoT-based linked healthcare systems. Patient-centric approaches and process-centric approaches are the two main taxonomies into which they divided their analysis of a substantial number of papers in this topic. The research on intelligent wellness tracking technologies and the various types of sensor components utilized in the Internet of Things was evaluated by Yang and Wang [19]. When classifying and analyzing the works, consideration was given to the application of both device-based and device-free strategies, as well as signal processing and classification techniques. Al-Rawashdeh and Keikhosrokiani [20] looked into the adoption and use of IoT in smart healthcare. They gathered existing information about the factors that encourage healthcare professionals to utilize IoT technologies. They collected, analyzed, and synthesized relevant information in great detail. Abdulmalek Nasir[21] examined the latest advancements in healthcare systems for monitoring using IoT. The benefits of IoT-based healthcare systems, particularly their significance and benefits for IoT healthcare, were covered in their research. They thoroughly assessed recent research on IoT-based healthcare monitoring systems through a review of the literature.

IV. HOSPITALS EMBRACE HEALTHCARE DIGITIZATION

India wants to dominate the world in digital healthcare. In order to give patients and healthcare professionals access to all the information they need, this includes information technology solutions for patient records. It also involves managing appointments and payments, as well as digitally pairing patients with hospitals and certain medical specialists. The patient experience and health outcomes can then be enhanced using all of these data. It might be expanded to include information from wearable devices that gather daily data on vital signs like blood pressure and heart rhythm, as well as the use of artificial intelligence and the Internet of Things in the diagnosis.

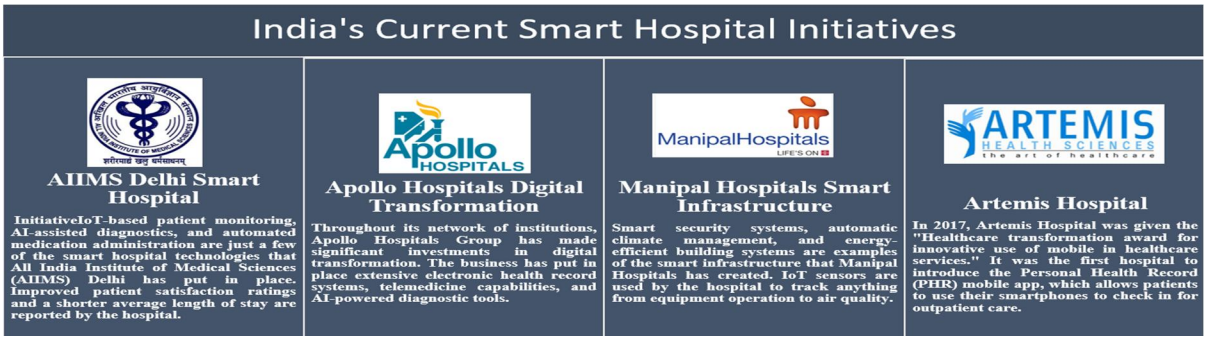


Fig 5: India's Current Smart Hospital Initiatives [22]

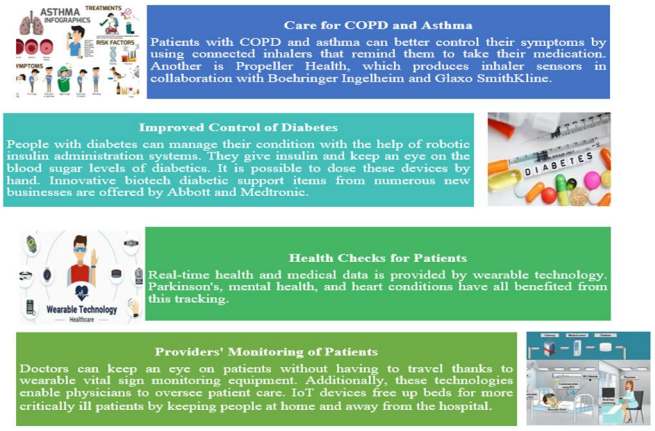


Fig 6: How can IoT sensors helped to Patients [23]

V. CHALLENGES AND FUTURE SCOPE

The connected devices and intelligent infrastructure of the Internet of Things (IoT) are revolutionizing the healthcare sector. These IoT solutions for healthcare facilitate data-driven decision-making, improve operational effectiveness, and allow patient-centric treatment. IoT is changing the way healthcare is provided, administered, and experienced, from smart hospitals to remote monitoring. It drives individualized care, streamlines processes, and enhances results in all care environments.

IoT in healthcare has enormous potential, however there are major obstacles to its adoption that must be overcome:

1) Privacy and Data Security: IoT devices that gather healthcare data are susceptible to hacks since the data is extremely sensitive. Ensuring IoT trust and safeguarding patient privacy require strong security measures including encryption, access limits, and audits.

2) Integration and Interoperability: IoT ecosystems for healthcare frequently include systems and devices from several suppliers, each with its own standards and protocols. Realizing the full potential of IoT in healthcare requires ensuring smooth data transmission and interoperability between these different components.

3) Adherence to Regulations: IoT solutions for healthcare must manage a complicated regulatory environment that includes GDPR, HIPAA, and several medical device laws. For IoT-based healthcare interventions to be safe, effective, and private, compliance with these regulations is essential.

The size of the India Internet of Things in Healthcare Market was projected to be 2913.6 USD million in 2024, according to Market Research Future report. The market for Internet of things in healthcare is expected to increase at a compound annual growth rate (CAGR) of 11% between 2025 and 2035, from 3245.75 USD million in 2025 to 9551.6 USD million. The internet of things in healthcare sector is greatly impacted by the Indian government's aggressive promotion of technology usage in healthcare. The goal of programs like the National Digital Health Mission is to establish a digital health ecosystem that unifies different medical services. IoT-based healthcare solutions are among the $1.5 billion the government has set aside for digital health initiatives. This assistance promotes cooperation between the public and private sectors in addition to stimulating innovation. In order to improve service delivery and operational efficiency, healthcare companies are investing more and more in IoT technologies. It is anticipated that the government's dedication to enhancing healthcare infrastructure and accessibility will propel the internet of things in healthcare market's expansion, perhaps resulting in a 30% rise in IoT adoption among healthcare facilities by 2027. The demand for remote healthcare solutions is significantly increasing in India's internet-of-things-in-healthcare sector. The requirement for ongoing patient monitoring and the rising incidence of chronic illnesses are the main causes of this trend. India's chronic disease burden is expected to exceed 75 million by 2030, according to latest estimates, requiring creative approaches to healthcare delivery.

From 2025 to 2035, the Internet of Things in Healthcare Market is expected to expand at a compound annual growth rate (CAGR) of 11.4%, propelled by advances in technology, rising healthcare costs, and growing need for remote patient monitoring.

There are new opportunities in:

- Creation of predictive analytics tools powered by AI for patient care.
- IoT device integration with telehealth systems to improve patient participation.
- Development of personalized wearable health monitoring systems for the treatment of chronic illnesses.

The market is anticipated to develop significantly by 2035 due to growing IoT technology usage and innovation [24].

VI. CONCLUSION

IoT has a revolutionary function in healthcare, providing several chances to enhance patient care, hospital productivity, and general health outcomes. The future of healthcare is being driven by IoT applications in wearable technologies, remote monitoring, hospital administration, and AI integration. IoT has many advantages, such as lowering medical expenses and hospital stays and improving individualized care. However, issues with data security and privacy continue to be crucial issues that need to be resolved in order to guarantee the safe and efficient adoption of IoT. IoT technologies have the potential to completely transform healthcare as they develop, making them an essential part of contemporary medical practice. Going ahead, the Enhancing data security, guaranteeing device compatibility, and encouraging innovation that supports patient-centred care should be the main priorities.

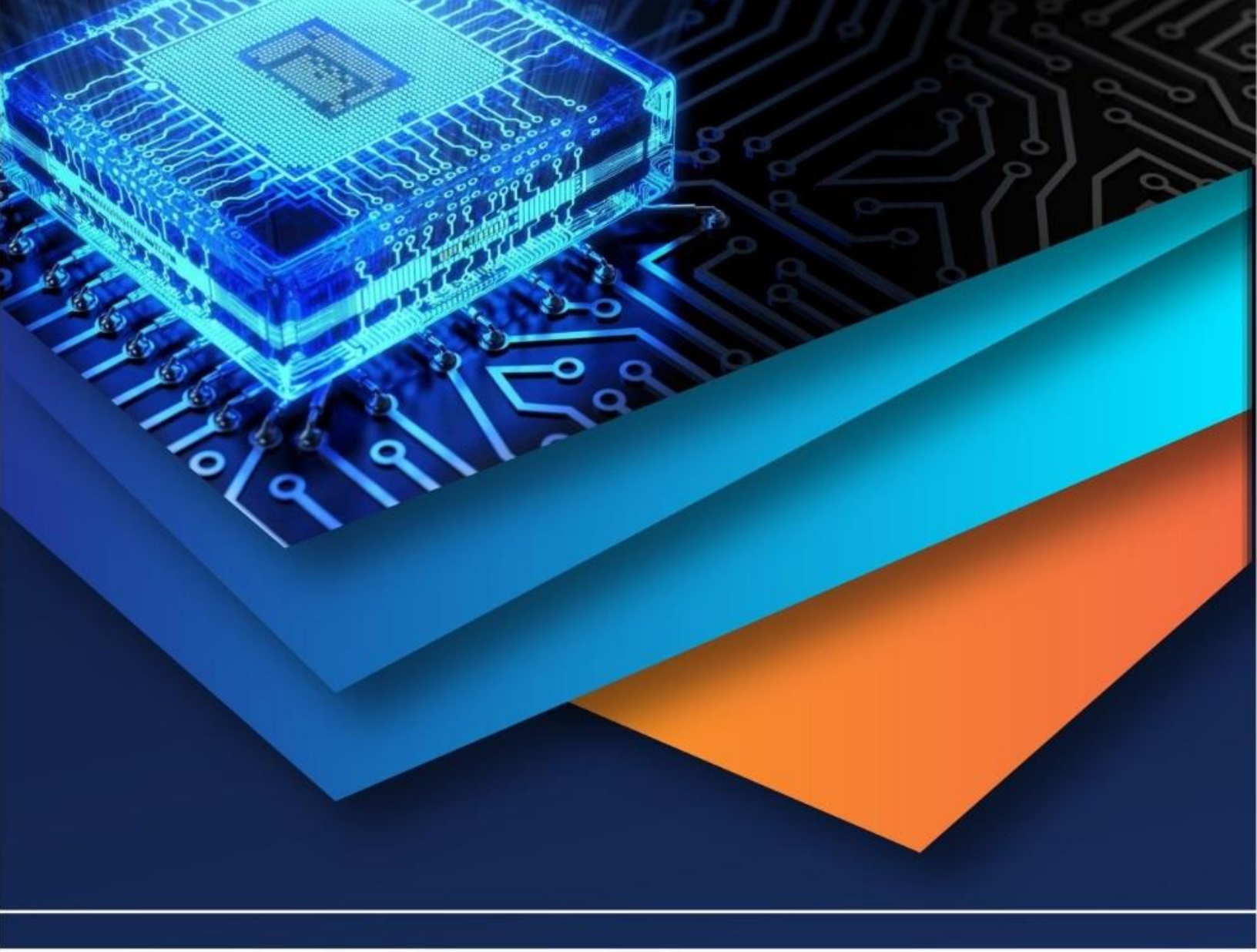
REFERENCES

[1] Chen G, Xiao X, Zhao X, Tat T, Bick M, Chen J (2021) Electronic textiles for wearable point-of-care systems. Chem Rev 122(3):3259–3291

[2] Mansour M, Gamal A, Ahmed AI, Said LA, Elbaz A, Herencsar N, Soltan A (2023) Internet of things: a comprehensive overview on protocols, architectures, technologies, simulation tools, and future directions. Energies 16(8):3465

[3] Ryalat M, ElMoaqet H, AlFaouri M (2023) Design of a smart factory based on cyber-physical systems and internet of things towards industry 4.0. Appl Sci 13(4):2156

[4] Dang, V. A., Vu Khanh, Q., Nguyen, V. H., Nguyen, T., & Nguyen, D. C. (2023). Intelligent healthcare: Integration of emerging technologies and Internet of Things for humanity. Sensors, 23(9), 4200.
[5] Mansour, M., Gamal, A., Ahmed, A. I., Said, L. A., Elbaz, A., Herencsar, N., & Soltan, A. (2023). Internet of things: A comprehensive overview on protocols, architectures, technologies, simulation tools, and future directions. Energies, 16(8), 3465.
[6] Haitaamar, Z., Sulaiman, A., Bendoukha, S. A., & Rodrigues, D. (2023). Lower inclination orbit concept for direct-communication-to-satellite internet-of-things using lean satellite standard in near-equatorial regions. Applied Sciences, 13(9), 5654.
[7] Bhuiyan, M. N., Rahman, M. M., Billah, M. M., & Saha, D. (2021). Internet of things (IoT): A review of its enabling technologies in healthcare applications, standards protocols, security, and market opportunities. IEEE Internet of Things Journal, 8(13), 10474-10498.
[8] Atadoga, A., Omaghomi, T. T., Elufioye, O. A., Odilibe, I. P., Daraojimba, A. I., & Owolabi, O. R. (2024). Internet of Things (IoT) in healthcare: A systematic review of use cases and benefits. International Journal of Science and Research Archive, 11(1), 1511-1517.
[9] Iqbal, K. (2023). Resource Optimization and Cost Reduction for Healthcare Using Big Data Analytics. International Journal of Social Analytics, 8(1), 13-26.
[10] https://www.techtarget.com/iotagenda/tip/Top-9-applications-of-IoT-in-healthcare
[11] Raghuvanshi, A., Singh, U.K., Joshi, C. A review of various security and privacy innovations for IoT applications in healthcare. Advanced Healthcare Systems: Empowering Physicians with IoT-Enabled Technologies p. 43–58 (2022)
[12] Islam SR, et al. The internet of things for health care: a comprehensive survey. IEEE access. 2015;3:678–708. doi: 10.1109/ACCESS.2015.2437951. [DOI] [Google Scholar]
[13] Nuscheler D, Engelen A, Zahra SA. The role of top management teams in transforming technology-based new ventures' product introductions into growth. J. Bus. Ventur. 2019;34(1):122–140. doi: 10.1016/j.jbusvent.2018.05.009. [DOI] [Google Scholar]
[14] Alshehri F, Muhammad G. A comprehensive survey of the Internet of Things (IoT) and AI-based smart healthcare. IEEE Access. 2020;9:3660–3678. doi: 10.1109/ACCESS.2020.3047960. [DOI] [Google Scholar]
[15] Tuli S, et al. Predicting the growth and trend of COVID-19 pandemic using machine learning and cloud computing. Internet of Things. 2020;11:100222. doi: 10.1016/j.iot.2020.100222. [DOI] [PMC free article] [PubMed] [Google Scholar]
[16] Rananga, N., Venter, H. Mobile Cloud Computing Adoption Model as a Feasible Response to Countries' Lockdown as a Result of the COVID-19 Outbreak and Beyond. In 2020 IEEE Conference on e-Learning, e-Management and e-Services (IC3e). IEEE (2020)
[17] Dadhich P. Cloud computing impact on healthcare services during COVID-19 Pandemic. Int. J. Res. Analytical Rev. 2021;8(1):38-42–3842. [Google Scholar]
[18] Hayyolalam V, et al. Edge-assisted solutions for IoT-based connected healthcare systems: A literature review. IEEE Internet Things J. 2021;9(12):9419–9443. doi: 10.1109/JIOT.2021.3135200. [DOI] [Google Scholar]
[19] Yang Y, et al. A review of IoT-enabled mobile healthcare: technologies, challenges, and future trends. IEEE Internet Things J. 2022;9(12):9478–9502. doi: 10.1109/JIOT.2022.3144400. [DOI] [Google Scholar]
[20] Al-Rawashdeh M, et al. IoT adoption and application for smart healthcare: a systematic review. Sensors. 2022;22(14):5377. doi: 10.3390/s22145377. [DOI] [PMC free article] [PubMed] [Google Scholar]
[21] Abdulmalek S, et al. IoT-based healthcare-monitoring system towards improving quality of life: A review. Healthcare. 2022;10:1993. doi: 10.3390/healthcare10101993. [DOI] [PMC free article] [PubMed] [Google Scholar][Ref list]
[22] https://www.dr-hempel-network.com/health-policies-in-india/digital-healthcare-initiatives-of-top-5-hospitals-in-india/
[23] https://www.marketresearchfuture.com/reports/india-internet-of-things-in-healthcare-market-51591



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 (24*7 Support on Whatsapp)