International Journal on Recent and Innovation Trends in Computing and Communication
ISSN: 2321-8169 Volume: 11 Issue: 10
***Article Received:** 22 August 2023 **Revised:** 07 October 2023 **Accepted:** 22 October 2023*

Investigation of Secure Health Monitoring System Using IOT

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Abstract
The rapid progress of technology, particularly the Internet of Things (IoT), has introduced exciting opportunities for transforming the healthcare sector. One significant area where IoT has made a significant impact is in the creation of secure health monitoring systems. These systems utilize IoT devices and sensors to gather and transmit live health data, facilitating remote monitoring and individualized healthcare.The integration of IoT in healthcare monitoring offers numerous benefits, including improved patient outcomes, enhanced access to care, and increased efficiency in healthcare delivery.To develop you would typically follow a research methodology that involves several key steps. Clearly state the objectives of your research, such as designing and implementing a secure health monitoring system using IoT. Specify the aspects you want to focus on, such as data privacy, authentication, encryption, or device communication. Develop a high-level system architecture for your health monitoring system. Define the components, their functionalities, and how they interact with each other. Consider the security aspects, such as secure data transmission, authentication, access control, and data storage.By multiplying each of our goals by a weight provided by the user, we can scale our collection of goals into a single goal using the weighted sum approach. One of the most popular strategies is this one. Finding the appropriate weights to give each aim while using the weighted sum approach is a concern. Taken as alternative parameters for HMS1, HMS2, HMS3, HMS4, HMS5. Taken as evaluation parameters for Portability,Round-The-Clock Health Surveillance,ease of use,Reliability.HMS1 performance is good when compared to others so HMS 1 is preferred except HMS 1 performed better in secure health monitoring system using IIOD.
Keywords: Portability,Round-The-Clock Health Surveillance,ease of use, Reliability,IOT.

1. INTRODUCTION

The proposed system utilizes various technologies such as communication, the concept outlined involves utilizing imaging, sensing, and human-computer interaction technologies for the purpose of diagnosing, treating, and monitoring patients without causing disruption to their daily lives. The proposal suggests the implementation of a cost-effective medical sensing, communication, and analytics device that enables continuous monitoring of patients' physical conditions in real-time through an internet-connected network.To facilitate efficient scheduling of appointments between patients, hospitals, caretakers, and doctors, the Internet of Things (IoT) network is proposed. This network would enable active and real-time coordination. In order to ensure secure transmission of data for remote monitoring, an architecture is recommended for a low-cost embedded platform that is web-based and specifically designed for monitoring purposes.Biomedical devices are identified as the means to collect and transmit patient data. This can be achieved through technologies like Bluetooth or ZigBee, which enable the transfer of data to a central managing unit such as a PC or I TV. This information can be stored on the device itself or sent to a centralized collection centre accessible through the web or mobile devices.The combination of IoT and RFID (Radio Frequency Identification) is suggested to play a crucial role in object detection and personal identification, enabling unique patient identification and storage of their respective data. This approach could be useful for remote monitoring scenarios involving multiple patients.The passage also touches on the availability of digital medical records and the potential for publicly available statistical data. The interaction between patients and doctors generates data that can be used as a basis for decision support tools. For example, a tool could assist patients in comparing Prescription Drug Plans based on their individual situation and preferences, considering plan features and historic data on prescription spending.Overall, the passage presents ideas for leveraging technology in home health care systems to improve medication reminders, authentication, and remote monitoring while making use of IoT, RFID, and decision support tools based on patient data. the continuous improvement in healthcare monitoring through the use of IoT capabilities and equipment to track patients' health parameters. It mentions the development of healthcare devices that employ remote monitoring/diagnostics and the introduction of air ambulances in various countries to meet the increasing demands and emergency situations in healthcare.The identification of communication protocols and system architecture is considered a challenging task in healthcare monitoring. Continuous monitoring is crucial to track patients' body parameters and provide reliable data to doctors or medical teams for diagnosis. This approach is particularly beneficial for patients and elderly individuals during medical emergencies.Shortage of staff resources in the healthcare sector is mentioned as a common issue in many developed countries, including Egypt. To address this, new models for information management and communication are needed, especially for elderly people who live alone. Advanced communication technologies and data analytics should be integrated into healthcare services to improve care quality and reduce costs.Wireless sensor network technology is discussed as a means to detect vital parameters such as body temperature, pulse rate, and blood pressure in critical situations. The gathered data are transmitted wirelessly to a receiving station connected to a workstation, where it is processed securely and confidentially to ensure reliable real-time patient monitoring and prevent unauthorized access to patient data.The paper proposes a secure healthcare monitoring system using a fuzzy logic-based decision support system. The system utilizes a combination of fuzzy logic and a secure adaptive architecture to detect a patient's health status. The neural network is continuously trained and adaptable to changes in input, providing the desired output.The components of the proposed fuzzy system and the healthcare services it offers are described. The system architecture and its security requirements are discussed. An analysis of results and the reliability of the system are carried out. The paper concludes by stating the future scope of the developed healthcare system.Overall, the passage emphasizes the need for continuous healthcare monitoring, the integration of advanced communication technologies and data analytics, and the development of secure and reliable healthcare monitoring systems using fuzzy logic and IoT devices. The concept of the Internet of Things (IoT) and its potential applications. It explains that in IoT, a "thing" can refer to various objects, such as vehicles equipped with sensors to monitor tire pressure and other factors, animals with transponders and biochips for tracking, or people with implanted devices to monitor their health, like a heart implant to track blood flow. Essentially, any device or object that can be assigned an IP address and transmit information over a network can be part of the IoT.From a technological perspective, IoT systems involve communication and interaction between devices, generating large amounts of data. This data can be processed to provide value-added operations and enable control over various actions. IoT simplifies life for humans and traditional machines by creating effortless communication and automation.The passage emphasizes that IoT has significant benefits in data observation, communication, and application. It mentions that IoT is not limited to specific fields but can be extensively utilized in healthcare and medical research. IoT in healthcare has transformed from a dream to a practical reality with the advancement of technology. The challenges faced by many countries due to an increasing number of patients, which makes it difficult for them to access primary doctors or caregivers. However, the rise of the Internet of Things (IoT) and wearable devices has brought improvements in patient care through remote patient monitoring.Remote patient monitoring (RPM) allows for the monitoring and care of patients outside of the traditional clinical setting, such as in their homes. A key component of an RPM system is a specially designed monitoring device that can collect and transmit health data. This data is then sent to smart contracts, which are self-executing contracts with the terms of the agreement directly written into the code. Additionally, a smartphone with internet connectivity and an RPM application are typically used in the system.By implementing RPM, physicians can remotely monitor patients and provide care without the need for frequent in-person visits. This approach not only enhances the quality of care for patients but also allows physicians to treat a larger number of patients efficiently.Overall, the combination of IoT, wearable devices, and RPM systems has the potential to revolutionize healthcare by enabling remote patient monitoring, improving access to care, and increasing the efficiency of healthcare services. the importance of uplifting healthcare and biomedical advancement through technological advancements worldwide. It highlights the significance of enhancing the structure, trust, procedures, and efficiency of healthcare services to provide qualified nourishment and care to patients.The passage also acknowledges that in today's world, people tend to neglect their personal healthcare until a major health issue arises. This behaviour can be attributed to the busy and structured lifestyles that many individuals lead. However, it suggests that developing a system capable of detecting anomalies or abnormalities in a person's health and notifying a designated personal healthcare supervisor would greatly enhance convenience. This would enable timely and secure consultations with the patient, ensuring prompt and appropriate care.Byimplementing such a system, healthcare can become more proactive and personalized, enabling early detection and intervention. It aims to bridge the gap between individuals' busy lifestyles and their healthcare needs, facilitating a more effortless and efficient healthcare experience.The Internet of Things (IoT) consists of interconnected smart devices that exchange information with each other. These devices include intelligent sensors and wearable smart devices, which play a crucial role in various fields such as healthcare, mining, buildings, cities, agriculture, transportation, industries, and automated systems.In healthcare, smart medical devices enable the connection between people and smart objects, making life easier and simpler. The Internet of Medical Things (IoMT) is increasingly becoming an essential element in healthcare. It facilitates the collection of different types of information and transmits it to cloud repositories, providing smart healthcare services. The integration of IoT encompasses various aspects of healthcare, and the passage suggests the need for green solutions to address the challenging issues in the current strategies of IoT-based smart healthcare. Green solutions likely refer to environmentally friendly and energy-efficient approaches.Medical devices, in particular, enable remote monitoring of patients, which improves the quality and efficiency of their medical treatments. By leveraging IoT technology, healthcare providers can monitor patients from a distance and provide timely interventions.

2. MATERIALS AND METHOD

Portability: Portability in the context of a health monitoring system using IoT refers to the ability to easily move and deploy the system across different locations or environments. A portable system allows healthcare providers to monitor patients' health remotely, whether they are at home, in a hospital, or on the go. By leveraging wireless connectivity and lightweight IoT devices, healthcare professionals can monitor patients' vital signs, collect data, and provide timely interventions regardless of their physical location. This flexibility enhances patient care by enabling continuous monitoring and reducing the need for patients to be physically present in a healthcare facility. Portability also relates to the seamless integration and interoperability of the health monitoring system with existing healthcare infrastructure. A portable system should be capable of integrating with various healthcare devices, such as wearable sensors, medical instruments, or electronic health record systems. It should be able to exchange data securely and efficiently with different systems, ensuring compatibility and smooth operation. This interoperability allows healthcare providers to leverage existing resources and infrastructure, minimizing disruptions and maximizing the system's usefulness. Additionally, a portable system can facilitate data sharing and collaboration among different healthcare providers, improving the overall quality of care and enabling better healthcare outcomes.

Round-The-Clock Health Surveillance: Round-the-clock health surveillance involves the continuous By utilizing IoT devices and sensors, healthcare professionals can collect real-time data on a person's vital signs and health metrics, enabling them to detect any deviations or abnormalities promptly. Continuous monitoring allows for early detection of health issues or emergencies, facilitating timely interventions and potentially preventing serious complications. It provides a comprehensive picture of an individual's health over an extended period, enabling healthcare providers to make informed decisions and personalize treatment plans. Round-the-clock health surveillance using IoT enables conditions. With the help of wearable devices and connected sensors, individuals can be monitored remotely from their homes or other non-clinical settings. The collected data is transmitted in real-time to healthcare providers or monitoring centers, where it can be analyzed and interpreted. In case of any critical or concerning changes in the health parameters, automated alerts can be generated, notifying healthcare professionals to take appropriate actions. Remote monitoring and alerting ensure that individuals receive timely medical attention, even when they are not physically present in a healthcare facility, enhancing patient safety and enabling proactive healthcare management.

ease of use: Ease of use in a health monitoring system refers to the design and implementation of a knowledge or experience. This includes clear instructions, visual cues, and logical organization of information. A user-friendly interface reduces the learning curve and allows individuals to quickly grasp how to interact with the system, access their health data, and understand the presented information. It promotes usability and encourages regular engagement with the system, leading to improved health monitoring and adherence to the recommended protocols. Another aspect of ease of use is the seamless integration and automation of processes within the health monitoring system. The system should be designed to minimize manual input and streamline data collection and analysis. For example, by leveraging IoT devices and sensors, the system can automatically collect and transmit health data without requiring individuals to manually record or input the information. Similarly, automated data analysis algorithms can process the collected data and generate meaningful insights or alerts without the need for manual intervention. By reducing manual tasks and streamlining processes, the system becomes more user-friendly, efficient, and less burdensome for both healthcare professionals and individuals being monitored.

Reliabilty: Reliability in a health monitoring system collection and measurement. It is crucial for the system to provide reliable and trustworthy health data to healthcare professionals for accurate assessment and decision-making. The system should utilize high-quality sensors and devices that are calibrated and validated to ensure accurate measurement of vital signs and health parameters. The collected data should be free from errors, artifacts, or inconsistencies that could lead to incorrect interpretations or inappropriate interventions. Reliability in data collection is essential for providing healthcare professionals with a dependable and accurate picture of an individual's health status, enabling them to make informed decisions and deliver appropriate care. Another aspect of reliability is the system's availability and uptime. A reliable health monitoring system should be accessible and operational consistently, without significant downtime or interruptions. It should have robust infrastructure, reliable connectivity,

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and backup mechanisms to ensure continuous monitoring and data transmission. This is particularly important in critical situations where uninterrupted monitoring is essential. Additionally, the system should be resilient to failures or disruptions, with failover mechanisms and redundant components to minimize any potential impact on data collection or communication. By maintaining high system availability and uptime, the health monitoring system can ensure reliable and uninterrupted health surveillance, providing peace of mind to healthcare professionals and individuals being monitored.

A variation of the WSM called the weighted product method (WPM) has been proposed to address some of the weaknesses of The WSM that came before it. The main distinction is that the multiplication is being used in place of additional. The terms "scoring methods" are frequently used to describe WSM and WPM. A member of the more recent creation of MCDM techniques is the weighed aggregated sum product assessment (WASPAS) put forth by 15. addresses are two well-known addresses that are combined in this way. distinct descriptions of computing in the cloud are being developed by analyst companies, academics, industry professionals, and IT firms. Table 1 lists a variety of descriptions of online computing from various analyst firms.The weighed product, in which matrices are combined random, in which an arbitrary unbiased is chosen to be optimised at each step. When the weights are used to aggregate numerous matrices, two approaches can be employed to determine the weights that are used at every stage of the method dynamically: fixed, in which we can give to all ants the identical weight and every goal has the same significance throughout the method run; and assigning each ant a weight that differs from the rest of the ants at each repetition.Our method yielded a total of three clusters. The clustering empathy calculation was subsequently performed using a weighted product model. Three values, one for each, have been calculated obtained through the use of this product model.This paper proposes a novel approach that utilises online computing and enhanced k-means method. The precision of the method for clustering is increased through the enhanced k-means method, and its parallel processing on the basis of the MapReduce model increases the algorithm's effectiveness .The interaction between both of these hierarchies must be taken into account. With this particular approach, every hierarchy is viewed as a single component, and corresponding priorities are calculated after comparisons of pairs with respect to an unique order.Manually choosing the best option is very time-consuming. Consequently, a scalable and computerised method of cloud buying resources is required. Although cloud vendors are not yet providing standardised services, Rochwerger et al. note that this will need to change and that the "federated cloud has enormous potential." In such a scenario, it would be feasible to combine and swap resources provided by various cloud vendors and streamline the acquisition of the aforementioned assets .Due to its intellect and implied concurrency, artificial intelligence techniques like evolutionary computation, particularly when used in neural networks, have gradually gained attention.The Weighted Product Method (WPM), a technique from the field of multifaceted decision-making, is recognised as a straightforward, lightweight, yet effective method of contrasting substitutes in terms of numerous criteria, not always presented in the same units (in contrast to a similar, yet less useful, approach). Method of Weighted Sums.In the event that there are multiple pheromone matrices that the pheromone matrix collection and a heuristic function must be used. The weighed sum, the weighted product method, and choice at random are among the most frequently used operations.There are only two levels of priority overall: high and low. Every node begins with a low priority. It is anticipated that traffic that is permitted to move to a higher priority will receive better service. In the following section, alternative approaches to raising a particular node's priority are provided The WASPAS technique combines the weighted sum method (SAW) and the weighted product method, two multifaceted decision-making techniques. The individuals involved in the MABAC method calculate the separation between each alternative's standards operate and the border's approximation area. the one that is closest in weight to PM2, the ideal PM, which is PM1. However, after moving VM2 to PM2, PM2's memory usage rises to 0.51 percent, which is above the threshold. Next, TOPSIS must perform another relocation, and it decides to shift VM2 to PM1. RIAL calculates a comparable ideal PM as TOPSIS, but weights memory more heavily. As a result, it selects PM1 as the location with the most brief weighted distance.A decision support system has the capability to calculate employee performance appraisals in an optimal manner, ensuring a fair assessment based on predefined criteria. This system utilizes the weighted product weighting (WP) method to determine the employee's performance appraisal score, which ranges from the highest value representing the best employee to the lowest value indicating the worst employee performance. By employing this method, the decision support system can generate accurate calculations and effectively rank employees based on their performance.

3. RESULT AND DISCUSSION

TABLE 1. Secure health monitoring system using IOT

	Portability	Round-The-Clock Health Surveillance	ease of use	Reliabilty
HMS1	0.3417	0.9751	0.3902	0.2950
HMS2	0.3676	0.6566	0.1836	0.4053
HMS3	0.8103	0.1877	0.1408	0.3074
HMS4	0.1709	0.6124	0.4533	0.3605
HMS5	0.8065	0.5282	0.5678	0.0385

Table 1 showing alternative parameters for HMS1,HMS2,HMS3,HMS4, HMS5, evaluation parameters for portability, round-the clock health surveillance, ease of use, reability.

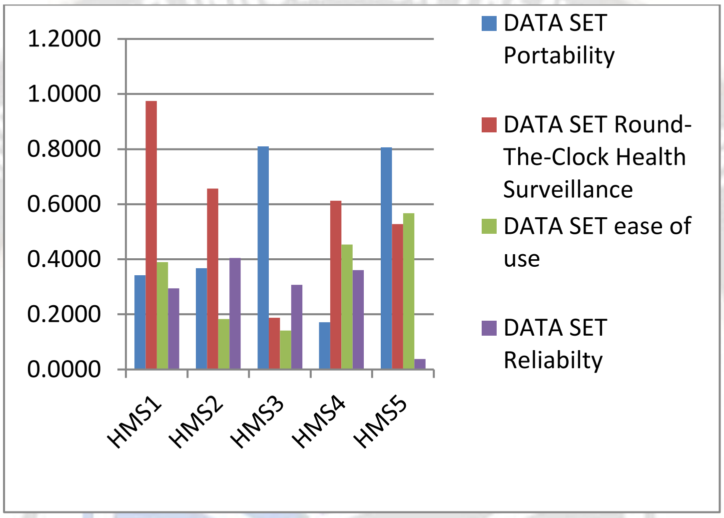

FIGURE 1. Secure health monitoring system using IOT

Figure 1showing alternative parameters for HMS1,HMS2,HMS3,HMS4, HMS5, evaluation parameters for portability, round-the clock health surveillance, ease of use, reability.

TABLE 2. Performance value

	Performance value			
HMS1	0.42174	1.00000	0.68711	0.72782
HMS2	0.45371	0.67336	0.32338	1.00000
HMS3	1.00000	0.19254	0.24805	0.75845
HMS4	0.21096	0.62807	0.79829	0.88949
HMS5	0.99532	0.54167	1.00000	0.09499

TABLE 2 Showing it seems that you have provided a table with some performance values for different entities or systems labeled as HMS1, HMS2, HMS3, HMS4, and HMS5. The table appears to have four columns representing different performance metrics.

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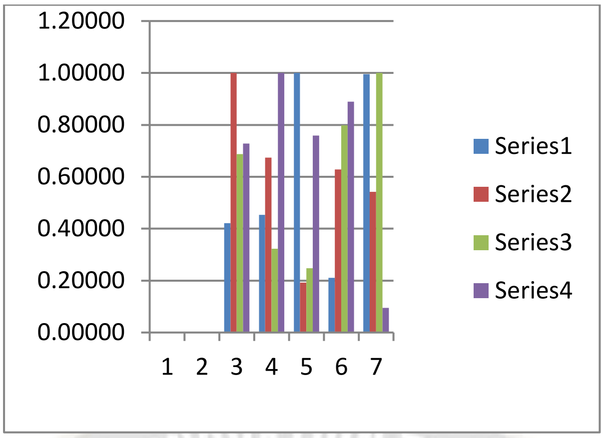

FIGURE 2. Performance value

FIGURE 2 Showing it seems that you have provided a table with some performance values for different entities or systems labeled as HMS1, HMS2, HMS3, HMS4, and HMS5.

TABLE 3. Weightages

	Weightages			
HMS1	0.25	0.25	0.25	0.25
HMS2	0.25	0.25	0.25	0.25
HMS3	0.25	0.25	0.25	0.25
HMS4	0.25	0.25	0.25	0.25
HMS5	0.25	0.25	0.25	0.25

Table 3 given weighted values are same value taken.

TABLE 4. Weighted normalized decision matrix

	weighted normalized decision matrix			
hms1	0.80586	1.00000	0.91045	0.92365
hms2	0.82072	0.90586	0.75410	1.00000
hms3	1.00000	0.66242	0.70572	0.93321
hms4	0.67772	0.89023	0.94523	0.97115
hms5	0.99883	0.85789	1.00000	0.55516

Table 4showing values represent the performance of each entity according to the respective metrics. However, without further information about the specific meaning or context of these metrics, it is challenging to interpret the significance of the values. If you provide more details or specify what you would like to know, I'll be happy to assist you further.

	Preference Score
HMS1	0.67768

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HMS2	0.56064
HMS3	0.43626
HMS4	0.55383
HMS5	0.47571

TABLE 5. showing preference score

Table 5 Based on these scores, it appears that HMS1 has the highest preference score, followed by HMS2, HMS4, HMS5, and HMS3. However, without additional context or information about the criteria used to assign these preference scores, it is difficult to interpret their meaning or significance.

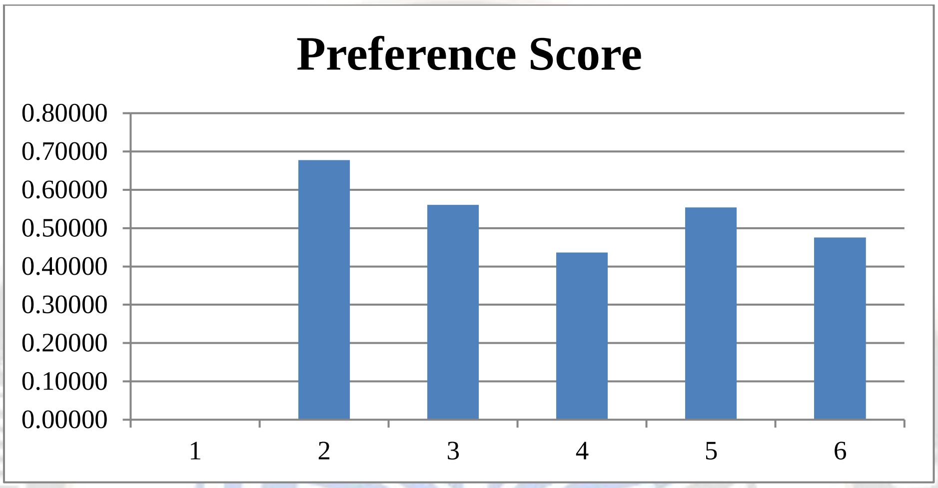

FIGURE 3. Figure 4 showing preference score value

Figure 3provided seems to represent a preference score for different entities labeled as HMS1, HMS2, HMS3, HMS4, and HMS5. Each entity has been assigned a single preference score.

TABLE 6 Ranking

HMS1	**1**
HMS2	**2**
HMS3	**5**
HMS4	**3**
HMS5	**4**

Table 6 Gives Ranking HMS1 is first rank, HMS2 second rank, HMS4 is third rank, HMS5 is fourth rank, and HMS3 is fifth rank

4. CONCLUSION

the implementation of a secure health monitoring system using the Internet of Things (IoT) offers numerous benefits in healthcare. Such a system enables continuous monitoring of patients' health parameters, facilitates remote patient monitoring, and improves the quality of care. By integrating IoT devices, wearable sensors, and communication technologies, healthcare providers can gather real-time data, transmit it securely to healthcare professionals, and enable timely interventions.The secure health monitoring system ensures the privacy and confidentiality of patient data through robust authentication and encryption mechanisms. It also addresses the challenges of data security, access control, and reliable transmission of information in a healthcare context.Additionally, IoT-based health monitoring systems provide opportunities for efficient resource allocation, cost reduction, and improved patient outcomes. Through remote monitoring, healthcare professionals can proactively manage chronic conditions, detect early warning signs, and provide personalized care.However, the require careful consideration of ethical and legal aspects, as well as adherence to data protection regulations. It is crucial to strike a balance between data collection for

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healthcare purposes and respecting individuals' privacy rights.Overall, the integration of IoT in healthcare and the establishment of a secure health monitoring system hold great potential for transforming healthcare delivery, improving patient outcomes, and enhancing the overall efficiency of healthcare services. Continued research, development, and collaboration among stakeholders are essential to realize the full benefits of IoT in healthcare and ensure. The implementation of a secure health monitoring system using IoT technology offers numerous benefits and possibilities in healthcare. By leveraging IoT devices and sensors, real-time monitoring of patients' vital signs and health parameters becomes possible, allowing for early detection of anomalies and timely intervention.The integration of IoT in healthcare enables remote patient monitoring, reducing the need for frequent hospital visits and improving access to care, especially for patients in remote areas or with limited mobility. It also enhances the efficiency of healthcare services by providing healthcare professionals with accurate and up-to-date patient data, enabling better decision-making and personalized treatment plans.Security is a critical aspect of IoT-based health monitoring systems. By implementing secure communication protocols, encryption techniques, and access control mechanisms, patient data can be protected from unauthorized access or breaches, ensuring privacy and confidentiality.Furthermore, the use of smart contracts and block chain technology in secure health monitoring systems can enhance trust, transparency, and data integrity. Smart contracts can automate processes, enable secure data sharing, and facilitate secure transactions between different stakeholders involved in healthcare, including patients, healthcare providers, and insurance companies.Overall, a secure health monitoring system using IoT holds great potential for improving healthcare outcomes, enhancing patient experiences, and reducing healthcare costs. interoperability, and standardization to ensure the successful deployment and widespread adoption of such systems in the healthcare industry.

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