A BIG DATA ASSOCIATED SMART HEALTHCARE PREDICTION STRATEGIES USING INTERNET OF THINGS

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Abstract
The impact of the Internet of Things (IoT) on the development of the healthcare industry is immense. The help of the Medicine 4.0 has resulted in an increased effort to expand platforms, both at the hardware level as well as the underlying software level. This innovation has led to the development of Healthcare IoT (H-IoT) systems. The fundamental enabling technologies cover the communication systems between the sensing nodes and the processors; and the processing algorithms for generating an output from the data collected by the sensors. Although, at present, these enabling technologies are also supported by several new technologies. Make use of Artificial Intelligence (AI) has transformed the H-IoT systems at almost every level. The fog/edge paradigm is carry the computing power close to the deployed network and hence mitigating so many challenges in the process. While the big data allows handling an huge amount of data. Also the Software Defined Networks (SDNs) carry flexibility to the system while the block chains are finding the most novel use cases in H-IoT systems. The Internet of Nano Things (IoNT) and Tactile Internet (TI) are propulsive the innovation in the H-IoT applications. This paper explore into the ways these technologies are alter the H-IoT systems and also identifies the future course for improving the Quality of Service (QoS) using these new technologies
Keywods - *H-IoT, WBAN, Machine Learning, Fog Computing, Edge Computing, Blockchain, Software Defined Networks*

Introduction

At the top of Nineteen Sixties, Arpanet, the primary network project sponsored by the U.S. Department of Defense designed the primary protocol referred to as network management protocol so as to attach completely different machines and share info by packet change. Later, Arpanet became web project and new normal protocol that was developed supported Associate in nursing open design philosophy. Thus, new protocols that are referred to as transmission management protocol (TCP) and also the web protocol (IP) were outlined successfully in early Eighties. web is currently opened to everybody World Health Organization desires to attach to. Thus, the quantity of hosts visible on the net grows exponentially and can be over fifty billion by 2020 in step with skilled estimations In some case, associate in Nursing IP proxy or package able to convert IP into dedicated wireless protocol is employed to confirm continuity between a sensing object that can't support IP and web. Objects connected to the net may be mobile phones, cameras, home appliances, town infrastructures, medical instruments, and plants or vehicles equipped with sensors.

Wireless sensors network is taken into account united of key technologies of IoT and it's wide utilized in numerous areas like tending systems, surrounding watching systems, structural health

watching (SHM) systems, etc [1]. As novel plan, IoT has apace become a gorgeous topic for researchers and industries SHM are advantageous to Industries, businesses, consumers, environment, people, and society. SHM is to gather information from multiple sensors put on structures so as to method and extract helpful info concerning current state of the structure for safety purpose [5]. Such systems, the number sampling which will be collected from sensible structures are thus massive and sophisticated that it will become tough to use information management systems to handle. Method such data, therefore the emergence of massive information technologies, which might be accustomed store and amounts of watching data [7].

Motivation

Old age patients, children with heart problems should be monitored continuously. Their family members or concerned doctors need to be informed about their health time to time, and mostly when patients are lonely at home If we want to apply this in current scenario then we need whole room occupied equipment's and they are highly costly So need to improve system that would be handy and less costly.

Objective

To monitor the user health details each and every second and update the details to Server via an advanced Internet of Things [IOT]. Care takers or other respective persons can immediately view or monitor the present position of user without any hidden activities. Attain high level of accuracy and speed.

Problem Statement

This day no automatic medication surveillance based health care system. Heavy machines are used to monitor the patient details in hospitals, which require huge space and power supplies while processing. Efficiency is poor compare to new technologies Internet of Things. There is no proper intimation system. Limited hospital resources, connectivity and range is available, so care takers are restricted to enquire the patient details only with doctor and they have to believe them. High cost and more time consumption.

Scope of the Work

Internet of Things will connect devices embedded in varied systems to the web. Devices will represent those digitally; they will be controlled from anyplace. The property then helps United States of America capture a lot of information from a lot of places, guaranteeing a lot of ways that of accelerating potency and up safety and IoT security [2]. IoT is transformational forces that may facilitate firms improve performance through IoT analytics and IoT Security to deliver higher results. Businesses within the utilities, oil & gas, insurance, producing, transportation, infrastructure and retail sectors will reap the advantages of IoT by creating a lot of au courant choices, power-assisted by the torrent of reciprocal and transactional information at their disposal. The term IoT is semantically associated with 2 words “Internet” and “Things,” wherever web is understood because

the international system that use TCP/IP protocol suite to interconnect completely different pc networks, whereas Things check with any objects that surround United States of America and have the aptitude to sense and collect information regarding its surroundings. IoT depends on a good vary of materials, network infrastructure, communication protocols, web services, and computing technologies. Among the vary of various technologies involve within the IoT thought, WSN is one amongst the foremost necessary technologies that modify the mixing of sensing devices into IoT ecosystems [10].

Users will remotely management the devices exploitation web services. They will conjointly access the information center via web anytime from anywhere so as to retrieve, process, and analyze information. IoT design is associate open design supported multi-layers. Services-oriented design is one amongst the approaches that are adopted by researchers in recent years to implement IoT system [9]. The layers move with one another by providing completely different services like sensing, transmission, collection, storage, and data process. IoT devices and sensors suffer from machine and energy constraints. Therefore, to attain ability across the heterogeneous networks and seamlessly enable information exchange throughout IoT system, completely different protocols, and standards area unit established.

Related Work

Part of H-IoT. It also fails to cover the use of emerging technologies such as MLin Medium Access Control (MAC) and PHY layers. Additionally, this survey does not present any recent advances The Point-of-Care Devices (PoCD) working group of IEEE wasapprovedinSeptember2018tostandardizethearchitecture, communication, and QoS for service-oriented point-of-care medical devices and medical IT systems.The current literature explores the many facets of H-Io Tin detail. However, breakthroughs are made every day in the IoT technology, particularly in the healthcare sector. In various aspects of H-IoT are reconnoitered. A majority of these surveys explore the various individual objectives and functions, but the also review the associated technologies and aspects of H-IoT. review the various communication protocols and standards applicable to H-IoT. This paper explores the state- of-art pertaining to five application scenarios in which H-IoT can be instrumental. An introduction to the various communication technologies is presented along with the identification of challenges and future technologies in healthcare. This survey doesn't cover a key aspect of security and privacy, which is a major or contributions in mitigating the drawbacks and challenges in H-IoT. provides an insight into the application of fog computing in H- IoT. As low latency has been described as one of the basic requirements of H-IoT, fog computing is providing a solution by bringing the computational power closer to the network. The paper discusses the various fog-based frameworks and models in addition to subsystems that include the use of fog paradigm in the H-IoT architecture for a wide range of functions.

IOT

Figure.1 describes when one thing is connected to the web meaning that it will send info or receive info, or both. This ability to send and/or receive info makes things good and good is nice. Let's use Smartphone (Smartphone) once more as AN example. Without delay you'll be able to hear around any song within the world, however it is not as a result of your phone truly has each song within the world hold on that. However your phone will send info and so receive info. To be good, an issue ought not to have super storage or an excellent pc within it. All a issue has got to do is hook up with super storage or to an excellent pc. Being connected is awe-inspiring. An article by Sir Frederick Ashton revealed within the RFID Journal in 1999 same, "If we tend to had computers that knew everything there was to understand regarding things - mistreatment information they gathered with none facilitate from North American country." this is often exactly what IoT platforms will for North American country. It permits devices/objects to watch, determine and perceive a state of affairs or the environment while not being passionate about human help [12].

Figure 1 Connectivity using IoT

IoT platforms will facilitate organizations scale back value through improved method potency, quality utilization and productivity. With improved trailing of devices/objects mistreatment sensors and property, they'll get pleasure from period of time insights and analytics, which might facilitate them, create smarter selections. the expansion and convergence of information, processes and things on the web would create such connections a lot of relevant and necessary, making a lot of opportunities for individuals, businesses and industries .

IoT Standards and Protocol Stacks

The development of IoT systems depends on standards Associate in Nursing protocols stacks offered for interconnecting little and low-power devices additionally as a knowledge broker or an application. Numerous technologies area unit concerned in IoT paradigm. Example, IEEE 802.15.4 and IEEE 802.11 area unit the foremost relevant communication standards to be exploited whereas

deploying IoT devices [7]. Compared with Wi-Fi, that may be a protocol for low-power wireless native space network supported 802.11 standards, Zig Bee deals with low rate however the most important advantage is low-energy consumption since devices area unit restricted in battery power. Standard, the key challenge that must be taken into thought is the way to effectively adapt scientific discipline stacks on WSN. completely different solutions are developed in recent years as portrayed in earlier systems. As represented antecedently, scientific discipline is that the universal customary that permits digital communication over heterogeneous networks. IoT consists of an oversized variety of Internet-connected devices; every device is known with a singular scientific discipline address [13].

IPv4 supported 32-bit are used over years to assign scientific discipline address to any or all devices that require to be connected to the web. sadly, the amount of IPv4 addresses offered are going to be shortly exhausted to the actual fact that the amount of devices and application connecting to the web will increase rapidly[7]. so as to adapt the increasing variety of things to net, IoT community has adopted following generation of scientific discipline known as scientific. completely different comes conducted by the organization known as IETF guilty of net standards have planned standards that specify the employment of IPv6 on device in IoT system. This protocol is developed to change little sensing devices with low power and tiny reminiscences to hold IPv6 packets and participate within the IoT.It operates on the network layer with the target to hold and propagate IPv6 packets over a network with lossy, low information measure, and low-power communication system. protocols used for IoT in application layer embody affected application protocol. that area unit effectively accustomed interconnect and management remotely IoT devices, broker or gateways as portrayed in past systems. Besides the quality protocols outlined by IETF, alternative organizations have an interest within the development of low-power communications protocols and standards for IoT.

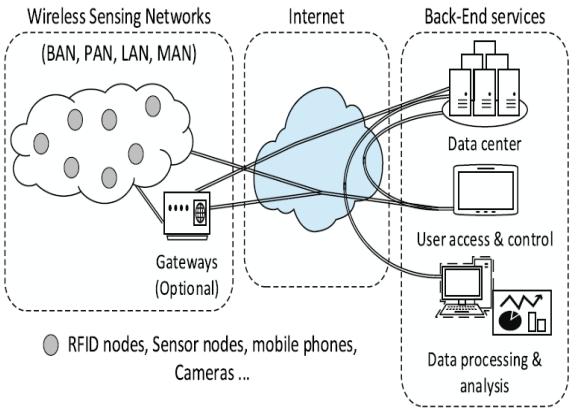

Figure 2 Internet of things [IOT] architectural design

Fig.2 describe IoT standard that specifies the design and interfaces of low-power wide space network (LPWAN) preparation. These normal protocols like long run evolution (LTE) technology

are utterly custom-made for devices that require to transmit low-data rate over a protracted vary.. These novel technologies, among others, are become the actual IoT standards that enable the transfer of tiny amounts of knowledge, processing, and communications between low-power devices across wide space network as enumerated in Table I. The potential applications, deployment, and future challenges of LPWA normal, furthermore because the most significant technologies concerned, are summarized in earlier systems.

IoT Applications

IoT has evolved considerably and become a reality due to its key technologies like WSN, RFID, and cloud computing that facilitate its integration into existing systems. during this context, IoT applications involve a large vary of areas like security and police investigation, environmental observation, medical and health care, SHM, agriculture, provision and transportation, producing, etc. IoT-based applications accept the creation of good setting and things like good homes, good cities, good infrastructures, good transport, good health, smart grid, and good merchandise. one in every of the well-known applications of IoT is within the health care sector, with the event of applications running on electronic devices, that mix sensors and movable as a platform to observe in period personal health status[3]. A decent example of IoT application-based mobile gateways for intelligent health observation is that the platform AMBRO, that is conferred in past systems. These styles of applications may also be used for patients or clinical experiments to record and method information so as to create a identification, treatments, and bar of some regular diseases. the appliance of IoT in industries is predicted to enhance business method and provide chain management with intelligent observation and services. Examples embrace intelligent electricity and water consumption services, intelligent parking services, on-line traffic observation, intelligent transportation, and so on. This paper introduces the abstract style of SHM system supported IoT. Many challenges concerning good sensors integration into IoT scheme and massive information management have to be compelled to be taken into thought before implementing such system. supported IoT and massive information tools, a reliable, versatile and large-scale health observation system are enforced so as to observe any events or changes in structural conditions in period furthermore on improve the standard of service in any urban and rural infrastructures like buildings, bridges, railway tracks, etc[9].

Structural Health Monitoring Scheme

SHM has been electing as a relevant subject of study in producing, engineering science, and region industries since it with success permit observation, performance analysis, prediction, and report of structure integrity. SHM is applied to new structures likewise on existing structures [4]. The aim of SHM application to new structures is to gather in period or in regular interval of your time, information associated with structural parts concerned within the fabrication, producing, and construction method so as to check safety risks throughout the erection of recent structures. As of, existing structures, the target of SHM application is to access a structure condition so as to calculate its remaining time. victimization numerous technologies, the observation system tracks any changes

on the structural parts or setting so as to discover doable events, deterioration or injury for maintenance, repair, retrofit and safety purpose. in keeping with earlier analysis, SHM application are often outlined as a method supported four steps. Detection, that provides data relating to the presence of any injury within the structure. This step is followed by localization step wherever the probable location of the injury is known. Last step is regarding the prediction of the remaining time structure. The authors, classification ought to be done before estimating the severity of the injury so as to offer data regarding the sort of harm. This implies the integrity of structures ought to be administered in keeping with the procedure following 5 steps: detection, localization, classification, assessment and prediction [8].

IoT-Based Structural Health Monitoring

The fast technological progress of sensible sensors, wireless communication techniques have revolutionized health observation of structures in region, auto motive, and engineering science field. As key technology of this revolution, WSN technology has considerably improved SHM systems implementation from sensing modules installation to device information transmission and process techniques Fig 2.3 describe As sensors become additional and additional intelligent with the mixing of WSN into SHM system, it's become speedily necessary to introduce novel communication protocols in sensors network development so as to manage remotely sensors likewise because the flow of knowledge generated by them. Thus, the interest in victimization net discipline standards to implement WSN technologies has fully grown considerably throughout the last decades. for instance, Heo and Jeon designed a sensible wireless structural observation system victimization Bluetooth technology and TCP/IP network protocol to speak information measured by sensors[7].Their system has been with success enforced and tested for real time SHM victimization at random excited paradigm self-anchored span.

The main advantages victimization IPs with WSN to implement a versatile SHM system comes from connecting the info acquisition scheme with AN external platform that enables period device access, management and management from anywhere. Interaction with sensible sensors and remote services needs IoT technologies to effectively integrate the web with SHM system. As results of the convergence of sensible sensing technologies, wireless technologies, data technologies, Internet, the mixing of IoT into SHM system can produce opportunities for brand new development of period information acquisition systems. AN example of AN SHM system, whereas victimization information science to speak data, and management sensors in real time is to program an information acquisition scheme which will send machine-controlled alerts to the observation center or engineers. if an occasion happens or once the info measured have exceeded a specific threshold value[5]. Thus, engineers or technicians accountable for maintenance and alternative observation tasks will access information and data from where they're employing a style of devices. Zhang et al. studied AN settingal impact removal based mostly SHM theme in AN IoT environment.

Using principal part analysis to get rid of environmental interferences from device information and Hilbert–Huang transformation combined with empirical mode decomposition for processing,

their results have shown a superiority of the projected theme within the accuracy of SHM and lustiness against environmental interferences. Myers et al. projected a mathematical model which will be integrated with AN IoT platform to discover the dimensions and placement of damages in physical structures employing a electricity device. Panthati AND Kashyap designed and enforced an SHM supported IoT victimization work read platform [3]. An affordable and versatile platform for remote bridge health observation victimization IoT to attach measuring system sensors to the web has been designed and enforced in earlier approaches.

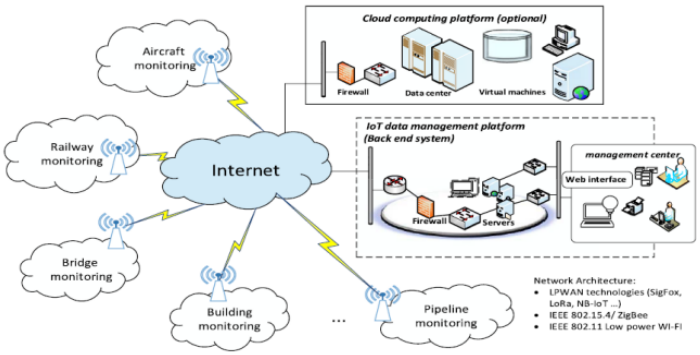

Figure 3 SHM framework overview based on IoT

To achieve that, the authors developed a Web API that collects data from an accelerometer and stores them on a Web server. Then, the vibration data are retrieved from the Web server and log onto Google spreadsheet, which enables end users to access in real-time vibration data of bridge and there by determining the health of the bridges.

System Analysis

Existing System

Now a day there is no automatic medication surveillance based health care system. Everything is done and monitored manually using man power. Heavy machines are used to monitor the patient details in hospitals, which requires huge space and power supplies while processing. Efficiency is so poor compare to the latest technologies such as Internet of Things (IOT).In most of the hospitals health professionals use heart rate monitoring systems using manual methods to measure ECG by connecting lids to the chest of patient. The graph of ECG is monitored on the bedside monitor or special monitoring devices. These devices are wired and bulky and do not support long distance communication. The systems have many disadvantages like requirement of costly hospital stays which is not affordable for longer periods, needs expert monitoring and high cost maintenance. Long-term care encompasses a broad range of help with daily activities that chronically disabled individuals need for a prolonged period of time. Long-term care is primarily concerned with maintaining or improving the ability of elderly people with disabilities to function as independently as possible for as long as possible; it also encompasses social and environmental needs and is

therefore broader than the medical model that dominates acute care; it is primarily low-tech, although it has become more complicated as elderly persons with complex medical needs are discharged to, or remain in, traditional long-term care settings, including their own homes; services and housing are both essential to the development of long-term care policy and systems. Nursing homes, visiting nurses, home intravenous and other services provided to chronically ill or disabled persons.

Even on normal days, hospitals often do not have sufficient staff power to service all the patients that are coming in. Pandemic only escalated this problem in times and showed the weaknesses in existing healthcare processes. Add to that a lack of qualified specialists, low number of well-equipped rooms, etc. Integrating Internet of Things to healthcare industry, we can significantly speed up and simplify the process of providing assistance. Connected technology can help monitor patient admission, optimize workflows, predict the influx of patients during an epidemic

Disadvantages

- There is no proper intimation system.
- Big Devices are required to monitor the patient and report the details.
- Limited hospital resources, connectivity and range is available, so care takers are restricted to enquire the patient details only with doctor and they have to believe them.
- High cost and more time consumption

Proposed System

In the proposed system, an efficient surveillance system is designed, that can monitor the patient on time and without the presence of the nurse in any place by using IOT technologies. In-house human behavior detection and Classification are involving in this system, even the patients can be monitored in any scenarios without any restrictions. Because of its compatibility and cost anyone can use this device so easily and its operation is too user-friendly. This system provides Global Communication with small size of devices with less power consumption**.** We have designed and implemented a healthcare monitoring system for cardiac patients to monitor significant body parameters of patient inside hospital as well as in home. Different sensors are attached or induced to the patient's body to collect vital body parameters like temperature, SPO2, heart rate, pulse rate etc. to be monitored. Heart rate and ECG sensor probes are also attached to patient's body. The sensor data is in the form of analog signals and to be converted into digital form using inbuilt circuits of Arduino board which collects and processes sensor data for further communication. For further use and storage it is then send to server using suitable wireless communication.

Using IoT data, we can better understand what condition the patient is in and respond accordingly. The collected information allows doctors to notice the changes and directly address any issues without waiting for symptoms to become obvious. For these purposes, application of neural networks for data analytics together with vast IoT data work great. This is one of the biggest IoT benefits in healthcare that can make a difference for the staff on the frontline. In the times of

pandemic, more and more patients need urgent help. Today, nurses or doctors work beyond their capabilities. They need tools to help them keep track of dozens and even hundreds of patients in real-time. With IoT tracking systems, they can get alerted immediately when critical changes in patients' parameters occur, quickly locate patients who need help and direct assistance as ap. Normally doctors spend hours processing different kinds of information. With IoT, it will take a few minutes. In addition, the Internet of Things, combined with AI and ML, can offer possible treatment options. Sometimes tests mix up, or the doctor may make a wrong measurement or incorrect conclusion. The human factor in medicine can lead to serious consequences. With IoT, this is largely avoided with checks and balances. The machine will provide maximum diagnostic accuracy.

Advantage

- Simplicity, mobility and low price.
- This system has ability to common people, especially children and age people, and don't need any special training.
- Power consumption is low.
- Compatible in size.

Hardware Implementation

These modules used in this system and all are listed below:

- Node MCU ESP8266 WiFi Module
- DHT11 Temperature and Humidity Sensor
- Heartbeat Module
- MEMS Sensor
- RFID card

Node MCU ESP8266 WiFi Module

Fig 4 describe ESP8266 Arduino Coreis a low-cost WiFi module that belongs to ESP's family which you can use it to control your electronics projects anywhere in the world. It has an in-built microcontroller and a 1MB flash allowing it to connect to a WiFi. The TCP/IP protocol stack allows the module to communicate with WiFi signals.

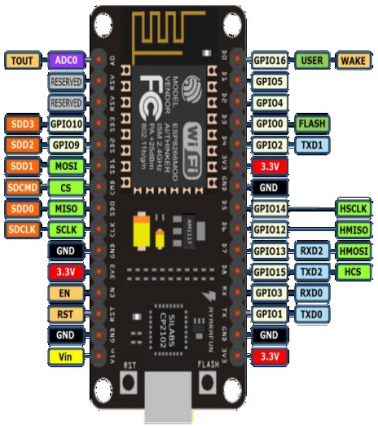

Figure 4 ESP8266 arduino core

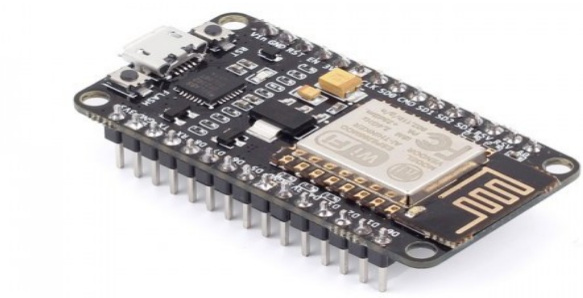

Figure 5 Node MCU ESP8266 Wi-Fi module

DHT11 - Temperature and Humidity Sensor

Fig. 6 describe The **DHT11** is a basic, ultra low-cost digital temperature and humidity sensor. It uses a capacitive humidity sensor and a thermistor to measure the surrounding air and spits out a digital signal on the data pin (no analog input pins needed). Its fairly simple to use, but requires careful timing to grab data.

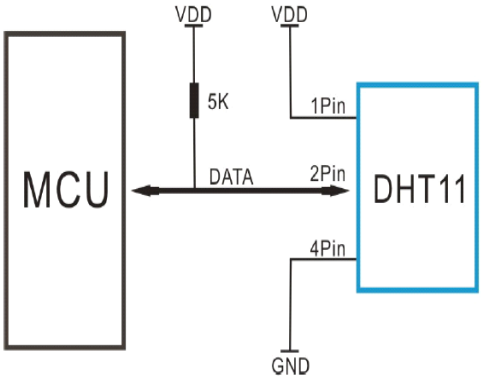

Figure 6 DHT11 connectivity

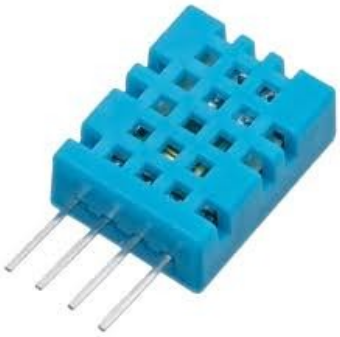

Figure 7 Images for DHT11 sensor

Heart Beat Module

Figure 8 describe **Heartbeat Sensor** is an electronic device that is used to measure the **heart rate** i.e. speed of the **heartbeat**. ... In order to measure the body temperature, we use thermometers and a sphygmomanometer to monitor the Arterial Pressure or Blood Pressure.

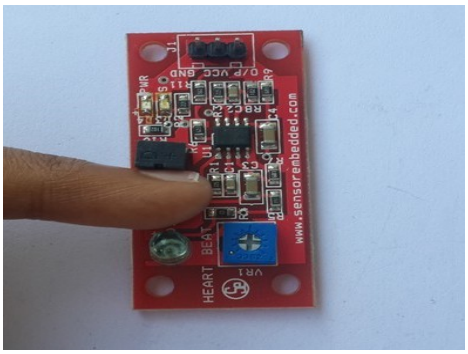

Figure 8 Heartbeat sensor module

MEMS Sensor

Fig 9 describe It is a chip-based technology, known as a Micro Electro-Mechanical System, that is composed of a suspended mass between a pair of capacitive plates. ...

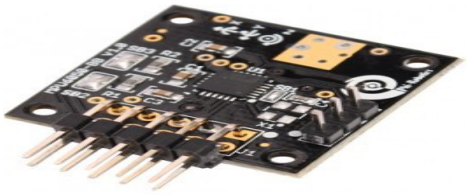

Figure 9 MEMS sensor

A **MEMS sensor** provides the convenient features that you can get with any other **sensor** line such as analog voltage, current and digital output options.

RFID Card

Fig 10 describe It provides hospital and laboratory staff with a real-time view of sample collection and tracking. General end users may be granted access to Control Point to view the dashboard, which displays the blood sample details, such as the Collector Name, Location (department), Patient MRN/UR, and number of samples, time of collection at bedside and receipt at Lab, unique Batch and Sample IDs and the movement of the sample through the hospital.

Figure 10 RFID card

Module Description

Internet of Things Layer

Medical Internet of Things is the group of devices connected to Internet, to perform the processes and services that support health care. MIoT has emerged as a new technology for e-healthcare that collects vital body parameters of patients and monitors their pathological details by small wearable devices or implantable sensors. MIoT has shown great potential in providing a better guarantee for people's health and supports a wide range of applications from implantable medical devices to wireless body area network (WBAN).It is used for sensing the date and collecting the data via wearable and implants Instead of going to the hospital for help, patients' health-related parameters can be monitored remotely, continuously, and in real time, then processed, and transferred to medical data center, such as cloud storage, which greatly increases the efficiency, convenience, and cost performance of healthcare. The amount of data handled by MIoT devices grows exponentially.

Fog Layer Distributed Computing

Fog computing is highly virtualized and provides a medium for computing, storage, and networking between end devices and the cloud. The main notion of fog computing is to migrate the tasks of data centers to fog nodes situated at the edge of the network. We refer to these fog nodes as the fog layer. As these devices that perform the tasks are at the edge of the network, it results in a higher data transfer rate and a reduced user response time.

Communication Layer

It used for transmission of sensed data from device to processor and vice versa. And it transfer the data in secure transmission I.e... Integrity of data is maintained. Ensure low latency with high reliability. As discussed, other important characteristics for the wireless network include data throughput, reliability, latency, security and privacy, cost-efficiency and seamless integration. Generally, a hospital contains number of communication devices where the electronic health records, real-time sensor data and other important information.

Processing Layer

The healthcare industry generates large amounts of data, driven by record keeping, compliance and regulatory requirements and patient care The current trend is toward rapid digitalization of these massive amounts of data, and their fusion with data retrieved from personal and mobility sensors. When it comes to health care in terms of patient records, treatment plans, prescription information etc., everything needs to be done quickly, accurately and in some cases transparently enough to satisfy stringent industry regulations.

System Architecture and Design

Fig 11 describe the heart rate variability (HRV) is an indicator of the health of the heart. It indicates the time intervals between the heartbeats and can indicate the presence of a heart attack or myocardial infarction. In order to estimate the HRV, a pulse sensor is used. This layer containing the sensor is termed as the things layer. The sensor records the heart rate that is transmitted to the data processing unit. In an H-IoT system, the sensed data is wirelessly transmitted to the processing layer. The processing layer is connected to the things layer via a communication layer. The wireless technologies used at this layer are low power consuming technologies such as Bluetooth, Zigbee, radio frequency identification, and Wi-Fi. The processing unit for extracting the useful features from the collected data can be implemented either on local hardware or remote cloud system. Since the amount of data generated by the sensor is substantial, a cloud-based solution is more feasible. However, the delay induced by transporting the data from the sensor to the cloud is significant than the delay incurred by processing the data at a local processing unit. It is called an edge node. The basic structure of the H-IoT system remains more or less the same, but sometimes an additional layer of distributed computing resources is included in the structure. The fog layer constitutes this additional layer. The advantages of the fog layer include reduced latency, improved data processing, enhanced security, and increasingly interoperable. Fig. 3 tries to exemplify the H-IoT system and its constituents.

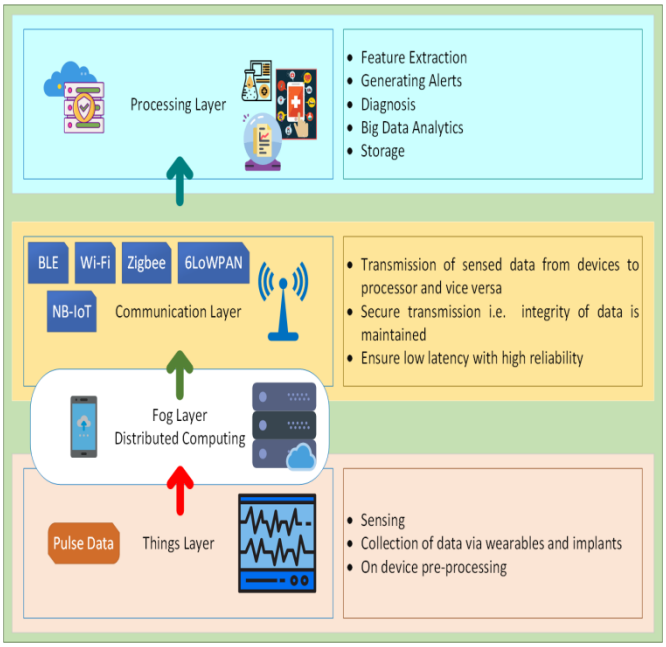

Figure 11 System architecture

Conclusion

The proposed data is analyzed based on age, time, obesity, month, heartbeat, temperature and humidity using R and implemented the use of Logistic Regression and decision tree for analyzing the accuracy. H-IoT is a system of sensors collecting the vital health data ubiquitously and sharing it over a secure network. The collected data is processed to look for any inconsistencies, and hence, an alert is generated if any are found. . These architectures are driven by ML, edge computing, and new technologies like SDN block chains. The capabilities of ML are exploited in multiple use cases of H-IoT and even maintaining the network and helping in achieving optimal network and service performance. Edge computing has a significant role in reducing the latency of the system and enhancing the reliability of the system by bringing the computing power to the edge of the network. It eliminates the need to send the traffic over to the cloud via an unsecured network, therefore contributing to the security of the data as well. Fog computing provides computational capabilities for a host of functions, ranging from storage to security, and processing to alert generation.

References

1. R. Cohen-Almagor, “Internet history,” Int. J. Technoeth., vol. 2, no. 2, pp. 45–64, Apr./ Jun. 2011.
2. P. Suresh, J. V. Daniel, V. Parthasarathy, and R. H. Aswathy, “A state of the art review on the Internet of Things (IoT) history, technology and fields of deployment,” in Proc. IEEE Int. Conf. Sci. Eng. Manag. (ICSEMR), Chennai, India, 2014, pp. 1–8.
3. O. Vermesan and P. Friess, Internet of Things—From Research and Innovation to Market Deployment. Aalborg, Denmark: River, 2014.

4. L. D. Xu, W. He, and S. Li, “Internet of Things in industries: A survey,” IEEE Trans. Ind. Informat., vol. 10, no. 4, pp. 2233–2243, Nov. 2014.
5. J. Yick, B. Mukherjee, and D. Ghosal, “Wireless sensor network survey,” J. Comput. Netw., vol. 52, no. 12, pp. 2292–2330, 2008.
6. G. T. Webb, P. J. Vardanega, and C. R. Middleton, “Categories of SHM deployments: Technologies and capabilities,” J. Bridge Eng., vol. 20, no. 11, Nov. 2015, Art. no. 04014118.
7. S. J. Samuel, K. RVP, K. Sashidhar, and C. R. Bharathi, “A survey on big data and its research challenges,” ARPN J. Eng. Appl. Sci., vol. 10, no. 8, pp. 3343–3347, May 2015.
8. L. Atzori, A. Iera, and G. Morabito, “The Internet of Things: A survey,” Comput. Netw., vol. 54, no. 15, pp. 2787–2805, Oct. 2010.
9. S. Madakam, R. Ramaswamy, and S. Tripathi, “Internet of Things (IoT): A literature review,” J. Comput. Commun., vol. 3, no. 5, pp. 164–173, 2015.
10. J. Jara, L. Ladid, and A. Skarmeta, “The Internet of Everything through IPv6: An analysis of challenges, solutions and opportunities,” J. Wireless Mobile Netw. Ubiquitous Comput. Depend. Appl., vol. 4, no. 3, pp. 97–118, Sep. 2013.D. Miorandi, S. Sicari, F. De Pellegrini, and I. Chlamtac, “Internet of Things: Vision, applications and research challenges,” J. Ad Hoc Netw., vol. 10, no. 7, pp. 1497–1516, 2012.
11. N. A. Somani and Y. Patel, “ZigBee: A low power wireless technology for industrial applications,” Int. J. Control Theory Comput. Model., vol. 2, no. 3, p. 27, May 2012.
12. J. Petrone. ZigBee IP and 920IP: ZigBee Innovation Connects Simple and High-Tech Devices for Consumers and Businesses, ZigBee Alliance. Accessed on Oct. 31, 2014.[Online].http://www.zigbee.org/zigbee-for-developers/network-specifications/zigbeeip
13. Z. Zhao, X. Wu, X. Lai, J. Zhao, and X.-Y. Li, “ZigBeevs WiFi: Understanding issues and measuring performances of IEEE 802.11n and IEEE 802.15.4 coexistence,” in Proc. IEEE Int. Perform. Comput. Commun. Conf. (IPCCC), vol. 33. Austin, TX, USA, Dec. 2014, pp. 1–8.
14. P. A. C. da Silva Neves and J. J. P. C. Rodrigues, “Internet protocol over wireless sensor networks, from myth to reality,” J. Commun., vol. 5, no. 3, pp. 189–196, Mar. 2010.
15. Fatima, Meherwar, and Maruf Pasha. "Survey of machine learning algorithms for disease diagnostic." Journal of Intelligent Learning Systems and Applications 9.01 (2017): 1.
16. Kannan, R., and V. Vasanthi. "Machine Learning Algorithms with ROC Curve for Predicting and Diagnosing the Heart Disease." Soft Computing and Medical Bioinformatics. Springer, Singapore, 2019. 63-72.
17. Weng, Stephen F., et al. "Can machine-learning improve cardiovascular risk prediction using routine clinical data?." PloS one 12.4 (2017): e0174944.
18. Goldstein, Benjamin A., Ann Marie Navar, and Rickey E. Carter. "Moving beyond regression techniques in cardiovascular risk prediction: applying machine learning to address analytic challenges." European heart journal 38.23 (2016): 1805-1814.