



# Machine Learning algorithms for Disease Prediction using IoT Environment

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**ABSTRACT:** Cloud computing is fundamental facilitator to e-health frameworks because of the way that it is equipped for giving essential computations and storage substructure to conquer the e-health information management issue. In this paper, At first, we address the main safety standards of the current healthcare system based in BSN. We then propose a safe IoT-based healthcare system using BSN, called BSN-Care, that can meet certain requirements efficiently. Body sensor network (BSN) technology is one of the most essential innovations in modern healthcare systems focused on IoT. It is essentially a series of low-power and lightweight wireless sensor nodes which are used to monitor the functions of the human body and its surroundings. Since BSN nodes are used to gather sensitive (life-critical) information and can function in hostile environments, they thus require strict protection protocols to avoid malicious device interaction. This paper essentially proposed a simple review of various current health care strategies using IoT. Here we discussed various existing system implementation strategies as well as identified gaps. This paper provides the way of future enhancement implementation with desired improvement.

**KEYWORDS:** Machine Learning, Internet of Things (IoT), Body Sensor Network (BSN), Fuzzy Random Forest (FRF)

## I. INTRODUCTION

Health is a complex process which has to be tracked continuously. Owing to the higher rate of patient admission to hospital, the health sectors have faced numerous hospital admission problems. To this end, a program for universal health treatment is being proposed. The program routinely tracks metabolic parameters of patients and identifies diseases using the parametric values obtained. As the number of sudden deaths caused by chronic heart disease or high blood pressure rises, continuous health monitoring services at home need to be provided. The primary goal was to establish a robust tracking program for patients so that healthcare professionals could monitor patients who are either hospitalized or conduct their usual daily activities. The patient management systems have recently been one of the big developments due to their improved technology[2]. In our system we calculate the different sensors available to the patient (ECG, temperature, heart rate, pulse, etc.). It sensor gathered data, i.e. biometric information is provided to raspberry pi and is then transferred to server.

## II. LITERATURE SURVEY

ProsantaGopeet. al. [1] proposed Wearable Medical Sensor-based System Design. The method addresses various programs, technologies and frameworks built on the basis of WMSs and sheds light on their objectives and challenges in design. Highlight the key safety principles of the new BSN-based healthcare system. Thereafter, we are proposing a robust IoT-based healthcare system using BSN, called BSN-Care, that can effectively meet those requirements. BSN's innovation in healthcare technology has made tracking of patients more workable. Recently,

numerous wireless healthcare experiments and programs have been developed to include ongoing monitoring of patients, in-ambulatory, in-clinical, and open environment (e.g. athlete safety monitoring).

According to Yena Kim[2] An algorithm that controls the load in WiFi networks to provide a delay requirement for physiological signals, especially for emergency messages, in environments where WBAN and WiFi based on ZigBee coexist. Because WiFi applications generate traffic with various delay criteria, we concentrate only on WiFi traffic, which does not require strict timing. We are therefore proposing an adaptive load control algorithm for ZigBee-based WBAN / WiFi coexistence conditions, with the goal of ensuring that the delay experienced by ZigBee sensors does not exceed a maximally tolerable time span. The main purpose of this application is to provide the hospital's fast facility. The shows wireless sensor networks can be commonly used in applications for healthcare.

KaleemUllahand Munam Ali Shah et. Al. [3] proposed a critically review the current literature, which explores how IoT can be applied effectively in the medical and smart healthcare sector. Secondly, we are proposing a new semantime model for e-Health for patients. The proposed model called 'k-Healthcare' uses four layers; the sensor layer, the network layer, the Internet layer and the layer of services. Effectively and effectively, both layers work together to provide a forum for accessing health data of patients using smart phones.As stated in the previous section, the use of different sensing devices and wireless sensor networks (WSNs) makes the IoT relevant in e-Health and medical care.

According to Raghav V. Sampangi [4] proposed A security suite for WBANs, consisting of IAMKeys, an independent and adaptive key management program for enhancing WBAN security, and KEMESIS, a core intercessor communication security management scheme. The innovation of such schemes is the use of a randomly created key to encrypt each data frame that is created on both the sender and the receiver separately, removing the need for any key exchange. Combined with the adaptability of key management, the simplicity of the encryption scheme makes the schemes easy and secure. The proposed system has the scalability and efficiently of the approach that collects the online analysis and monitored the patient in healthcare application.

VikasVippalapalliet. al. [5] proposed The devices capture and exchange the information easily with each other, and also store the information, allowing data to be collected and analyzed. Hence, patients can have high-quality care as the program assists medical personnel by offering real-time data collection, reducing manual data collection and allowing vast numbers of patients to be tracked.These sensors can be weared on the patient body that sensor collects the patient body that sensor collects the patient's physiological parameter and sends small mobile devices to the coordinator after the coordinator sends this data to the doctor's clinic via wireless network.

According PrabhaSundaravadevet. al. [6] An ambulatory health monitoring network architecture using a body-coupled contact channel. The framework suggested can be used as part of the Internet of Things for smart health tracking.The resistance to inputs helps set a corner frequency of one high-pass filter and pass bandstage.When the resistance to the input increases, the passband level increases and the frequency of the corner decreases which helps to boost the BCC channel gain.

In 2016, Kuo-HuiYehetal.presented [7] body sensor network (BSN) using IOT framework. They proposed robust crypto-primitives to create two communication mechanisms to ensure confidentiality of transmission and to provide authentication of entities among smart objects, the local processing unit and the BSN server backend. They used the Raspberry PI platform to demonstrate the feasibility and practicability of the approach provided. They have introduced safety part IOT-based testbeds. Raspberry Pi platform is represented as a smart mobile object or Local Processing Unit (LPU) here.

Chao Li et al. [8] implemented heart disease monitoring system that can send patients physical signs to remote medical applications in real time. A comprehensive tracking network that can transmit physical signs of patients to remote medical applications in real time. The heart rate sensor node analysis using embedded systems with the help of cogent engineering in 2017. It focused on health and wellness, safety, home rehabilitation, assessment of treatment efficiency and early detection of disorders. The IOT-based heart disease monitoring program developed

it based on interviews with medical experts for the ubiquitous healthcare service. Multiple clinical symptoms (hypertension, ECG, SpO<sub>2</sub>, heart rate, pulse rate, body fat and blood glucose).

PriyanMalarvizhi Kumar et al. [9] presented three-tier architecture of IOT with machine learning algorithm for heart disease early detection. They have proposed three tier architectures for store and process huge amount of data which is produced from wearable gadgets. Tier 1 focuses on collection of data from various sensors, tier 2 uses Apache HBase for storing large volume of data in cloud computing whereas tier III uses Apache Mahout for developing logistic regression-based prediction model. Finally, it does ROC analysis to get nodal analysis of heart disease.

In 2016, Mingyu Park et al.[10] introduced a smart chair program that tracks and visualizes the user's stance through a mobile app to help users correct their unbalanced stance. They had used pressure sensors and tilt sensing even for communication purposes using I and Bluetooth technology which transmits data with low power consumption. It is an implementation of Arduino which detects mainly different user postures. By presenting intuitive and visualized data in real time to the mobile client, this implementation supports the user to sit correctly with knowledge of their own current state. Under visualization the left and right side shows actual vs. ideal posture with the pressure shown in circles with red/yellow/green and orange colors. This is good example of internet of things technology.

### III.REVIEW OF LITARATURE

Author and Year	Title	Proposed Method	Advantages	Gap Identified
ProsantaGope and Tzonelih Hwang in IEEE 2016 [1]	BSN-Care: A Secure IoT-Based Modern Healthcare System Using Body Sensor Network	System proposed a health monitoring system on real conditions over the internet.	It can be provide 24*7 patient monitoring data over the internet.	1: It can just generate data but cant recommend any critical situations. 2: Its hard to understand to non technical persons.
Yena Kim, Student Member, seungseob Lee in 2015 [2]	Coexistence of zigbee - based WBAN and WiFi for Health Telemonitoring Systems	System propose an adaptive load control algorithm for ZigBee-based WBAN/WiFi coexistence environments, with the aim of guaranteeing that the delay experienced by ZigBee sensors does not exceed a maximally tolerable period of time.	1 : System can provide real serializable parameters of BSN without any delay.	Sometime it can predict false alarms when short time detection.
KaleemUllah, Munam Ali Shah, Sijing Zhang in 2015 [3]	Effective Ways to Use Internet of Things in the Field of Medical and Smart Health Care	The proposed model named as 'k-Healthcare' makes use of 4 layers; the sensor layer, the network layer, the Internet layer and the services layer. All layers cooperate with each	The system works with 4 different layer than be provide the flexible execution of system with	Sometime generate the delay in network phase because system does not use any standard protocol for data

		other effectively and efficiently to provide a platform for accessing patients' health data using smart phones.	highest accuracy.	transmission.
Raghav V. Sampangi, SaurabhDey, Shalini R. Urs, SrinivasSampalli in 2012 [4]	A Security Suite For Wireless Body Area Networks.	System proposed a security suite for WBANs, comprised of IAMKeys, an independent and adaptive key management scheme for improving the security of WBANs, and KEMESIS, a key management scheme for security in inter-sensor communication	The system focuses the security issue in inter sensor communication, it is important in WSN or health care communication.	System proposed key exchange protocol with symmetric encryption but will generate additional resource dependency.
VikasVippalapalli, SnigdhaAnanthula in 2016 [5]	Internet of things (IoT) based smart health care system	This work illustrates the design and implementation of a smart health monitoring system. Here, a patient can be monitored using a collection of lightweight wearable sensor nodes for real time sensing and analysis of various vital parameters of patients	The devices seamlessly gather and share the information with each other and also store the information, making it possible to collect record and analyze data.	There is no secure mechanism has used during the data sharing it can hack easily using different network attacks.
PrabhaSundaravadivel, Saraju P. Mohanty [6]	Exploring Human Body Communications for IoT Enabled Ambulatory Health Monitoring Systems	Proposed IoT base human body monitoring system	Provide continuous data streaming monitor patient health parameters.	High time complexity due to large data generation rate.

#### IV.CONCLUSION

According to the given review system reflects the various stages disease identification based on there body parameters. In such situations on the contrary doctors also need assistance for fast tracking ongoing number of patients. At some point due to lack of medical facilities in emergency situations, there is always a need of smart gadgets and smart technology to assist medical practitioners and even to the patients for better treatments of such an chronic kind of disease. The literature shows different approaches presented by various authors for health monitoring. But it has been found that mostly machine learning is the approach where human kind can able to program the machines or we can call it as smart machine to work as what we desired to be. So the trained machines behaved in the manner to achieve desired goal of the system.It also proposes its approach using different machine learning algorithms. As written above, it focused on supervised learning, unsupervised learning, semi-



supervised learning and reinforcement learning. This unit also presented the review of what is exactly machine learning.

## REFERENCES

- [1] ProsantaGope and Tzonelih Hwang, “BSN-Care: A Secure IoT-Based Modern Healthcare System Using Body Sensor Network”, IEEE Sensors Journal, 16 (5), 2016.
- [2] Yena Kim, Student Member, seungseob Lee, Student Member,andsukyoung Lee, “Coexistence of zigbee-based WBAN and WiFi for Health Telemonitoring Systems”, 2015.
- [3] KaleemUllah, Munam Ali Shah, Sijing Zhang, Department of Computer Science, University of Bedfordshire, Luton, UK, “Effective Ways to Use Internet of Things in the Field of Medical and Smart Health Care.”, 2015.
- [4] Raghav V. Sampangi, SaurabhDey, Shalini R. Urs, SrinivasSampalli,“A Security Suite For Wireless Body Area Networks”, International Journal Of Network Security and Its Applications (2012), Vol. 4, No. 1.
- [5] VikasVippalapalli, SnigdhaAnanthula, “Internet of things (IoT) based smart health care system” International conference on Signal Processing, Communication, Power and Embedded System (SCOPE)-2016.
- [6] PrabhaSundaravadivel, Saraju P. Mohanty, “Exploring Human Body Communications for IoT Enabled Ambulatory Health Monitoring Systems”, IEEE International Symposium on Nanoelectronic and Information Systems, 2016.
- [7] Kuo-HuiYeh,” A Secure IOT-Based Healthcare System with body sensor network”, IEEE access, 2016.
- [8] Chao Li, Xiangpei Hu and Lili Zhang,” The IOT based heart disease monitoring system for pervasive healthcare service”, ScienceDirect Computer Science 112, 2017.
- [9] PriyanMalarvizhi Kumar and Usha Devi Gandhi,” A novel three-tier internet of things architecture with machine learning algorithm for early detection of heart diseases”, J.Computers and Electrical Engineering, pp. 222-235, 2018.
- [10] Mingyu Park and YounghoonSong,JAewonLee,JeongyeupPaek,” Design and implementation of a smart chair system for IOT”, IEEE,2016.