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# Intelligent Computing in Engineering

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Zhonghyu (Joan) Lu · Prasant Kumar Pattnaik  
Editors

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Springer

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# Preface

The 4th International Conference on Research in Intelligent and Computing in Engineering, popularly known as RICE 2019, was held on August 08–09, 2019 in Hanoi University of Industry (HaUI), Hanoi, Vietnam.

The Fourth edition of RICE 2019, organized by the Electronic Engineering Faculty of the HaUI, provides an international forum which brings together the researchers as well as the industry practitioners, who are actively involved in the research in fields of intelligent computing, data science, or any other emerging trends related to the theme covered by this conference. RICE 2019 provided an opportunity to account state-of-the-art works, to exchange ideas with other researchers, and to gather knowledge on advancements in informatics and intelligent systems, technologies, and applications.

This conference has technical paper sessions, invited talks, and panels organized around the relevant theme. RICE 2019 was the event where the author had the opportunity to meet some leading researchers, to learn about some innovative research ideas and developments around the world, and to become familiar with emerging trends in Science and Technology.

RICE 2019 received a huge response in terms of submission of papers across the countries. RICE 2019 received papers from various countries outside Vietnam such as India, China, Russia, Australia, New Zealand, and many more. The Organizing Committee of RICE 2019 constituted a strong international program committee for reviewing papers. A double-blind review process has been adopted. The decision system adopted by EasyChair has been employed and 118 papers have been selected after a thorough double-blind review process. The proceedings of the conference will be published as one volume in *Advances in Intelligent Systems and Computing*, Springer, indexed by ISI Proceedings, EI-Compendex, DBLP, SCOPUS, Google Scholar, and Springerlink.

We convey our sincere gratitude to the authority of Springer for providing the opportunity to publish the proceedings of RICE 2019.

To realize this conference in 2019, we really appreciate Hanoi University of Industry to host the conference and to be continuously supporting the organization team during the preparation as well as 2 days of the conference. In addition, we

would like to give a special thanks to Vintech City, a member of Vingroup, that has supported the conference as a diamond sponsor. We would also like to thank the financial support of ASIC Technologies to RICE 2019. Without their support, this conference would have not been successful as the first time being held in Vietnam.

Our sincere gratitude to all keynote address presenters, invited speakers, session chairs, and high officials in India and Vietnam for their gracious presence in the campus on the occasion.

We would like to thank the keynote speaker as Prof. Vijender Kumar Solanki, CMR Institute of Technology, Hyderabad, TS, India; Dr. Le Hoang Son, VNU, Hanoi Vietnam; Dr. Kumbesan, Australia; Dr. P K Pttanaik, KIIT Bhubaneswar, Odisha, India; Dr. Rashmi Agarwal, MRIIS, Haryana, India for giving their excellent knowledge in the conference.

We would like to thank the reviewers for completing a big reviewing task in a short span of time.

We would also like submit our sincere thanks to the program committee members such as Dr. Le Van Thai, Dr. Hoang Manh Kha, Dr. Nguyen Thi Dieu Linh, Dr. Phan Thi Thu Hang, Dr. Tong Van Luyen—Electronic Engineering Faculty of the HaUI; Prof. Tran Duc Tan—Phenikaa University, Vietnam; and Dr. Raghvendra Kumar, GIET University, Gunupur, Odisha, India for their efforts to make congress success.

Moreover, we would like to thank all the authors who submitted papers to RICE 2019 and made a high-quality technical program possible. Finally, we acknowledge the support received from the faculty members, scholars of Electronic Engineering Faculty of the HaUI, officers, staffs, and the authority of Hanoi University of Industry.

We hope that the articles will be useful for the researchers who are pursuing research in the field of computer science, information technology, and related areas. Practicing technologists would also find this volume to be a good source of reference.

Hyderabad, India  
Ha Noi, Vietnam  
Huddersfield, UK  
Bhubaneswar, India

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# Health-Care Paradigm and Classification in IoT Ecosystem Using Big Data Analytics: An Analytical Survey



Riya Biswas, Souvik Pal, Bikramjit Sarkar and Arindam Chakrabarty

**Abstract** The Indian healthcare system is in a dilapidated state. Healthcare is important to society because people get ill. Healthcare is defined as the diagnosis, treatment, prevention and management of disease, illness and preservation of physical and mental well-being in humans. In our paper we have done healthcare surveys to analyze the aspects. In this paper some aspects of IoT healthcare and big data analytics are discussed. Big data can be used for better health planning. Its methodology can be used for healthcare data analytics which helps in better decision making. IoT is the fast developing wireless and web technologies sensors are used to predict the disease supported on IoT are used to develop the healthcare sector. Hence it is assertive that we do, various classifications in IOT are discussed. Hence it is assertive that we do initial surveys on the concept of Big Data, on Healthcare aspects and IoT ecosystem as how we can manage to handle large data files.

**Keywords** Big data · IoT · Healthcare device · IoT ecosystems

## 1 Introduction

Cumbersome amount of structured and unstructured data it is used to describe by Big data which is a buzzword. Some characteristics of Big data [1, 2]. As healthcare sector is expanding extremely. The volume of produced data is rapidly expanding every year

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due to existence of unique technologies, appliance and transmission [3]. In the current analysis of smart phones and wearable devices, endless figure of health data folder of patient from various challenges continue featured by healthcare industry [4]. Mostly complication arise where system proceed through divergent data sets [5, 6]. Various aspects of IoT is being discussed in this paper i.e Cancer which is a unchecked expansion unusual unit in any place in a body. Heart disease which is a dominating to conditions to that action area that influenced our heart and affect diminish or clog blood vessels. HIV/AIDS is a germ that mark and alter exempt system. Asthma is one of the most common chronic diseases that has a intelligent impact on people's well-being and in our society. Diabetes is a scheme of metabolic diseases consist of high blood sugar levels concluded lengthy season. For tracking the disease IoT are implemented. IOT basically a model for interconnecting sensor which track, sensing, process and diagnosis [7]. IOT basically composite of physical objects and domain where enclosed device content across the internet [8, 9]. IoT assist self management of disease. Over internet areas like health, Logistics, industry, security, agriculture and environment etc are basically empowered by the IOT appliances [10].

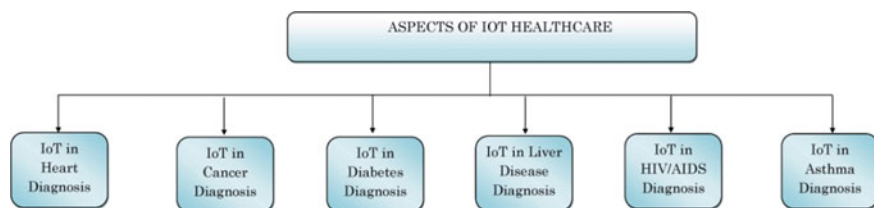
In this paper, we are going to discuss literature survey and classification in the Sect. 2. Section 3 deals with the analytical survey, table and policy design

### ***1.1 Motivation***

Big data is not only data it has turn into a entire subject, which involves different device, approach and scheme. Big data is transformative attempt in day-day-life. As in present day there is immense bulk of data, examining these acceptable sets which encompass of structure and unstructured data of various type and size; big data analytics grant the user to evaluate the impractical data to generate a faster and superior judgment. It is establish that big data is calculated to expanding rapidly in healthcare than in other sectors like manufacturing, financial services or media. Big Data and Analytics as with the Internet of Things (IoT). The term big data is one of burning technology. The big data analytics in healthcare covers assimilation and investigation of huge amount of data of complicated heterogeneous data. since Big Data can be advantage to consider user data and the prescribed assistance. It will trying to design program that will allow health care to reach those area where access to hospital was somewhat limited. IoT refers to the computerized intelligent curb and direction of connected associated devices over boundless regions via sensors and other computing capacity.

## **2 Classification and Analytical Survey**

In this section, we will discuss the IoT-based healthcare paradigm and its classification. We have also discussed the analytical survey in this related field.



**Fig. 1** Classification of IoT aspects

Figure 1 describes the different aspects of IoT-based healthcare. Chavan et al. [9] discussed for creating, acquiring, comparing some technologies like Hadoop, HDFS, Map Reduce, Pig, Hive, HBase are used here. Khan et al. [11] It describes proposed data life cycle which utilize the technologies and nomenclature of Big data management, investigating and scarceness. Nizam et al. [12] discussed that Big data is a type of dataset which is very massive and complicated that get difficultly to computing them exploiting traditional data processing applications. Chen et al. [13] discussed Big data then study about the connected technologies i.e. cloud computing, Internet Of Things, data centers and Hadoop. Archana et al. [14] deliver about the perception of how we expose newly expose surplus. Prasad et al. [15] author discussed that diabetes is one of the leading non-communicable disease. This system will prophesy exploring algorithm in Hadoop/Map Reduce environment. Huzoor et al. [16] author explains that Diabetes Mellitus (DM) is one of the starring health hindrance about the world initiating national economical concern. King et al. [17] author discussed that the asthma is characterized by hyper-responsiveness and can be avert by convenient benefit of remedial assistant to conduct asthma charge. Alpert et al. [18] author discussed that the heart failure is an developing public health complication with huge morbidity and probity. Stewart et al. [19] author describes the cardiovascular disease is a compelling and constantly-developing complication. Simon et al. [20] author describes that the HIV-1 pandemic is a complex blend of distinct contiguous. This paper brings on epidemiology. Bhatti et al. [21] author describes that the exploration of the human immunodeficiency virus (HIV) as the original organism of captured immunodeficiency disorder (AIDS). Constatine et al. [10] the author described that breast cancer is one of the biggest fatal disease of world. This paper proposed machine learning algorithm that for Big data analysis leading of an map reduce and mahout. Priya et al. [22] author describes that in first phase, min max normalization algorithm is enforced. Second phase by need of pso character choice. In fourth phase the efficiency will be determined accepting root men square value. Nahar et al. [23] initial forecast of liver disease is very crucial to deliver life and holding appropriate step to curb the disease. Shandilya et al. [24] in the current age automation medical field has develop into one of the favored affair of researcher and cancer. This paper generate survey of such current research study that cause usage of online and offline data for cancer classification. Alharam et al. [25] author describes. The main aim of this paper is for conserving healthcare industry from attack of cyber. Kumar et al. [26] author describes that traditional health center based

approach healthcare is identified with the arrival of large precision sensors and IOT. Kumbi et al. [27] author describes that the IOT is the leading network infrastructure of shipment of connectivity, transportation Technology which is proposed healthcare by the IOT.

### 3 Analysis of IoT Devices for Healthcare

See Table 1.

### 4 Policy Design and Constraints in Implementing in India

India seriously needs for reforms in their policy mix particularly in the field of health sector. The world is preparing them to welcome and grab the opportunity matrix that is emerging through the incorporation of 4th Industrial revolution. This is the high time to prepare for optimal participation of Indian firms. The following policy interventions may be exercised.

- (i) The 4th Industrial revolution has brought gigantic opportunities in the field of IoT, RFID led ecosystem primarily in the domain of health care sector. The larger enterprises should concentrate in the new business domain as the potential market opportunities are increasing day by day. The big firms or the consortium of large firms may invest on R & D in collaboration with the premier research organizations of the country. The govt. should encourage this mission by offering some lucrative package like tax holiday or relief for the firm for next three years. The firms may be incentivized by promoting SEZ or providing subsidy.
- (ii) The Indian MSMEs must initiate to this call of the hour. The firms may introduce their activities in the healthcare domain. As of now, there are various attempts are made to develop innovative branch of research augmenting various forms of technology with the healthcare domain. The branch of biomedical engineering, nano technology and electronic devices is being frequently used in the modern health services. The MSMEs can identify a niche market specializing any of the innovative techno-oriented direction and cutting-edge research which can be converged in modern medical system.
- (iii) The IoT based infrastructure can be conjugated with creating healthcare alarming devices. The psycho social behavioral pattern of a set of patients may be studied and the common patterns may be digitally incepted in the IoT led instruments in the line of censory device like e-nose, RFID sensors for detecting aroma or pigments and even the unnatural body movements to detect the cases that comes under broader domain of ergonomics.

**Table 1** Features and benefits of IoT devices For healthcare

Sl. No.	Disease	IoT devices	Features of IoT device	Benefits
1	Cancer	1. Electronic-nose 2. Biosensor	1. Smart device, authentic, flexibility, quality control 2. Quick, authenticate detection, decent, observing of angiogenesis, cancer metastasis	1. The give off breath of patients with lung cancer characteristics that can be with a computerized nose 2. Biosensors can catch whether a tumor is exist, whether it is favorable or cancerous
2	Heart disease	1. Smartphone 2. Heart beat sensor	1. Rapid analysis, flat cost, familiar 2. Low-cost	1. The sensor associate to a module in the smart phone over the audio jack 2. Heart attack disclosure using Heart Beat Sensor effort on Photoplethysmography (PPG) art.
3	Diabetes	1. Insulin pump 2. Gluco track	1. Flexibility, predictable, reducing wide fluctuations in blood glucose 2. Pain free, Reading history data, user friendly, easy to read data	1. It is a small, automated device that device that bear insulin continuously all over the day 2. A glucose monitoring home device sensor is used to measure the concentration blood.
4	Liver disease	1. MRI 2. e-nose	1. Images come, approach organ morphology, physiology, functions contrast 2. Alluring, ancient and marginally faecal aroma of the emit breath	1. MRI evaluate liver function, usually expressed via the Child-Pugh score 2. e-nose could be a authentic non-invasive apparatus for characterizing CLD

(continued)

- (iv) In the era of big data analytics, the predictive analogy in the healthcare sector is emergent to prevent it mammoth outcome on human civilization. The growing concerns of environmental pollution have been challenging the very existence of our civilization. The IoT based ecosystem may be applied in a less expensive manner to identify whether the region are crossing the vulnerable and critical

**Table 1** (continued)

Sl. No.	Disease	IoT devices	Features of IoT device	Benefits
5	HIV	1. Photonic crystal (PC) biosensors 2. Novel BioNanoSensor	1. Rapid, sensitive, 100% efficiency, label-free, 2. Inexpensive, portable, simple, sense gases	1. Biosensors optical detection method for bimolecular, cells, and viruses 2. BNS device that employ automation to identify the existence of the HIV
6	Asthma	1. Bracelet 2. HET wristband	1. Authentic measuring and measure 2. Controlling volatile organic compounds, circulatory humidity and temperature	1. It benefit wearers anticipate a looming asthma attack 2. It is a wearable system that could record framework to forecast asthma attacks

level of pollutants so that appropriate measures can be prescribed. The device may also identify the root causes or epicenter of such pollutants so that the multiple stakeholders can intervene and address the issue.

To implement all such modern techniques, India should progress and contribute in the age of Fourth Industrial Revolution. There are several inherent constraints for its implementation particularly in Indian context.

1. The achievement in this new era of technology needs holistic, inclusive and comprehensive growth in the field of technology, its availability, ease of accessibility, technical knowhow for its use, capacity of investment and overall dynamics of its adaptability in real life practice.
2. The IoT technology is the platform to facilitate the healthcare support but the country desperately requires a basic infrastructural facility for health-care services. The issues of malnutrition, vaccination, basic sanitation and the most importantly the awareness of people in general etc have been creating the stumbling block to achieve success in the cause of humanity.

## 5 Conclusion

In this literature survey, big data and its various concepts are included. The words big data has been coined to depict this newness. This paper also defines the characteristics of big data. With the advance of big data, we could answer questions that were beyond research in the past, extract knowledge and insight from data. it is understood that



every big data platform has its individual focus. Big data analytics in healthcare is germinating into a promising field for affording acumen from very large data sets and enhancing conclusion while compressing amount. Big Data today carry a lot of promise for the healthcare sector. So, implementing healthcare analytics with expeditious organization, and evolution of big data will make rapid and exact diagnosis which will decrease blunder and bring convenient treatment. using. IoT devices to handle their health requirements. To afford relevant cure to the patient, symptoms are determined from the excessive number of data. Aspects of IoT have been presented.

IoT can detect, determine, and accessed by devices like actuators, sensors or other smart devices. In this paper a review on big data, healthcare, IoT usage in healthcare has been presented.

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