

# Chapter 18

## Healthcare–Internet of Things and Its Components: Technologies, Benefits, Algorithms, Security, and Challenges

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### **ABSTRACT**

*Elderly population in the Asian countries is increasing at a very fast rate. Lack of healthcare resources and infrastructure in many countries makes the task of providing proper healthcare difficult. Internet of things (IoT) in healthcare can address the problem effectively. Patient care is possible at home using IoT devices. IoT devices are used to collect different types of data. Various algorithms may be used to analyse data. IoT devices are connected to the internet and all the data of the patients with various health reports are available online and hence security issues arise. IoT sensors, IoT communication technologies, IoT gadgets, components of IoT, IoT layers, cloud and fog computing, benefits of IoT, IoT-based algorithms, IoT security issues, and IoT challenges are discussed in the chapter. Nowadays global epidemic COVID19 has demolished the economy and health services of all the countries worldwide. Usefulness of IoT in COVID19-related issues is explained here.*

### **INTRODUCTION**

The Asian population is increasing at a very fast rate. The cities accommodating more population and it is increasing with time. Health facilities and resources are also growing but the growth rate is not enough to meet the requirements. Therefore, the health management in these cities is under tremendous pressure to provide medical facilities to cover the entire population. In the year 2050 Asian population of elderly people will be too large to handle with present infrastructure. So there is need to find new ways to provide the health care services to the large population. Use of IoT in Health care services has capability to full-fill these needs. In some countries sufficient health care infrastructure is not available to full fill

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## **Healthcare-Internet of Things and Its Components**

medical needs of poor people population in particular. IoT is cost effective technology and it can be afforded by the developing and underdeveloped countries in Asia like Pakistan, Sri Lanka, Afghanistan, Nepal, Bangladesh etc. So it is required by their government to take initiatives and provide better help for people living in rural and remote areas. As the population of the Asian countries will increase day by day, so the health care is out of reach of the most of the people or patients in developing countries. Moreover, poor citizens cannot afford it. In some chronic diseases like heart failure, Asthma attack and diabetes, real-time monitoring via connected devices can save the life of the many patients.

According to the United Nations Population Fund (UNFPA, 2017) in the Asia the proportion of the elderly people is expected to grow from 10.5 percent to 22.4 percent during the years 2012–2050. Now in East Asia, the proportion of the elderly is expected to be increased 34.5 percent by 2050. Japan (41.5 percent), South Korea (38.9 percent), China (34 percent) may be expected to report the highest proportions of the elderly population in that region by 2050. The S. R. Islam, D. Kwak, M. H. Kabir, M. Hossain, & K. S. Kwak (2015) conducted surveys on advances in IoT-based health care technologies and reviewed the state-of-the-art network architectures/ platforms, applications, and industrial trends in IoT-based health care solutions and analyzed distinct IoT security and privacy features, including security requirements, threat models, and attack taxonomies from the health care perspective. In their paper the Natarajan, Prasath, & Kokila (2016) discussed that the rapid development of Internet of things (IoT) technology makes it possible for connected various smart objects together through the Internet and provided more data interoperability methods for application purpose. In the article Gnanaraj, Ranjana, & Thenmozhi (2019) explained that in hospitals it is very difficult for doctors to attend the patients, because doctors cannot be available all the time in the hospital because of their busy schedule. Hence there is a need for a solution to monitor the patients any time for the doctors from any place. With the development of Internet of Things (IoT) devices in the recent years a solution is proposed for this. The Maksimović (2017) explained about enabling access to high-quality healthcare to anyone, from anywhere are the main advantages of the IoT-driven e-health systems and described as numbers of medical devices and sensors and 24/7 monitoring of health parameters, consequently led to enormous quantities and varieties of data. In the article Routray and Anand (2017) explained the modern world where the quality of living has been degraded significantly IoT can certainly play a constructive role in providing better services.

## **IoT TECHNOLOGIES**

In this section the different technologies used in IoT are discussed. IoT needs different sensors, connectivity and components. So all these technologies are discussed one by one.

### **IoT Sensors**

There are many types of IoT sensor and each one has different purpose. So according to purpose and type sensors are described as follows in given Table 1 and Table 2.

There are different types of sensor used in patient body to collect the medical data. Some general sensors and their position in body are shown in Figure 1.

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