



# SMART HEALTHCARE SYSTEMS USING BIG DATA ANALYTICS

<sup>1</sup>MALAVIKA A, <sup>2</sup>TINA BABU C

<sup>1</sup>MSc Scholar, <sup>2</sup>Assistant Professor

<sup>1,2</sup>Department of Computer Science

<sup>1,2</sup>St.Joseph's College (Autonomous), Irinjalakuda, Thrissur, India

**ABSTRACT:** Big data is a large amount of information that can do wonders. Big data has become popular for the past couple of decades because of its great potential. Every industry generate, manage, store, and analyze big data to improve their profit by implementing better decisions. The sources of big data in the healthcare industry include medical records of patients, hospital records, reports of medical examinations, and medical device results. These data can be maintained and analyzed properly to get the meaningful information needed to improve the health care system. This paper gives a review on big data technologies, big data analytics, its implementation, and challenges in making a smart healthcare system.

**KEYWORDS:** Big data, Big data analytics, Healthcare, Big data Technology, Apache Hadoop, Stream Processing

**INTRODUCTION:** Big data is a great volume of complex data that are difficult to manage and store by conventional methods and can be also structured and unstructured data that are further analyzed to get knowledge, and which is used for better decision-making and problem-solving to improve the industrial needs. The more information we have got, the more optimally we will organize ourselves to deliver the most effective outcomes. That's why data collection is an important part of each organization. Today, we are getting a lot of data from our different social activities like work, school and industries and are increasing day by day. The technological advances have helped us in generating more and more data, even to grade where it's become unmanageable with currently available technologies. This has led to the term 'big data', which explains the data that are large and difficult to manage. So as to fulfill our present and future social needs, we must develop new strategies to prepare this data and derive meaningful information. One such important social responsibility is healthcare. Like every other industry, healthcare systems are producing data at an unbelievable rate that presents many advantages and challenges. In this review, we discuss the fundamentals of big data including its management, analysis, and future aspects in building a smart healthcare system.

**ROLE OF BIG DATA ANALYTICS IN HEALTHCARE:** Big data, as the name implies, refers to massive quantities of data that are ungovernable with standard software or web-grounded platform. It exceeds quality storage, processing, and analytical potential. In beginning, big data had three known characteristics namely Volume, Velocity, and Variety (3 Vs). These 3 Vs then became the standard definition of big data. In meantime, other Vs are added to define big data and the most welcomed 4th V was Veracity.

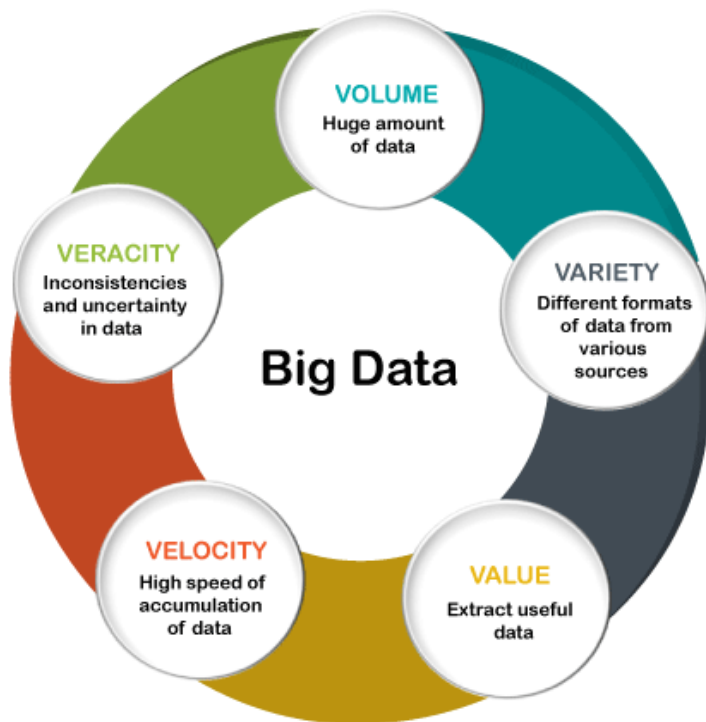


Fig.1.Characteristics of Big data

In recent times, the term "big data" has gained a lot of traction around the world. Nearly every field of study, whether in industry or academia, generates and analyses large quantities of data for a variety of pretensions. The most delicate task in dealing with this massive pile of data, which can be both systematized and unorganized, is managing it. We need technically advanced applications and software that can use fast and cost-effective computational capacity for similar work, since huge data is ungovernable with caliber software. We need to evolve better means to handle this 'boundless amount' of data for effective analysis and to get useful knowledge. With proper storehouse and logical tools in hand, the information and perceptivity deduced from big data can make the critical social structure factors and services like healthcare further apprehensive, interactive, and effective.

Big data in healthcare can be captured with the help of advanced information technology; making the disquisition of information to make better policy-making possible. Big Data analytics can be used to achieve pricey information from large and complicated datasets via data mining. Different forms of healthcare data sources include clinical text, electronic medical records (EMRs), hospital data, biomedical images, medical device readings, genomic data, biomedical signals, and sensing data. With the arrival of computer systems and its implicit, the computerization of all clinical tests and medical histories in the healthcare systems has become a standard and extensively took on practice today. The analysis of genomic data lets people have a much broader understanding of the connections among different inheritable labels and disease conditions. Likewise, transfiguring genetic discoveries to individualized drug practice is a task with numerous undetermined challenges. Clinical text mining convert data from clinical notes that are organized in an unshaped format to useful information. Information recovery and Natural Language Processing (NLP) are techniques that uproot useful information from large volumes of clinical text.

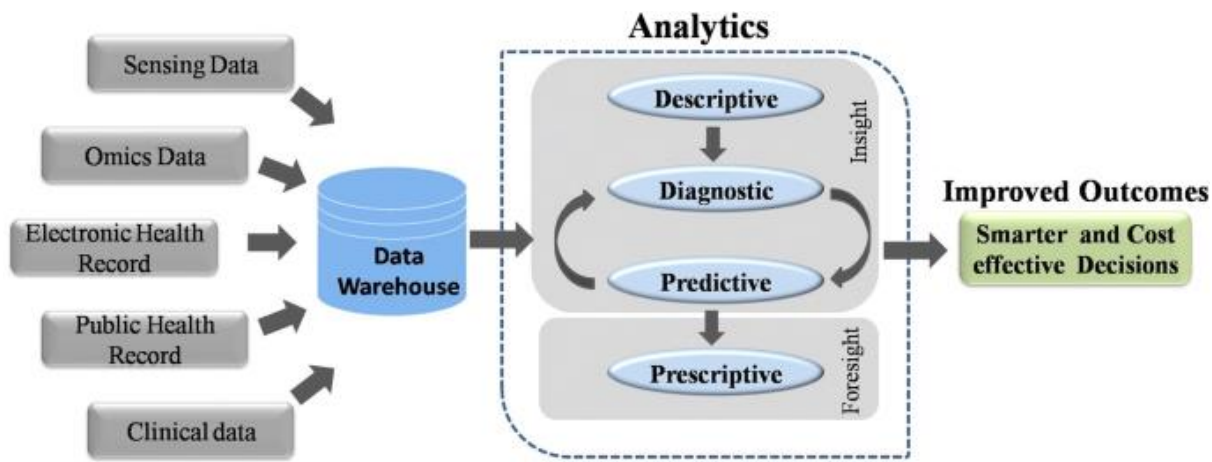


Fig.2. Big Data Analytics in Healthcare

Most healthcare information is unstructured in nature with huge volume and is handled to derive useful insights by using technical tools and statistical methods. But huge volumes of such data need to handle with specific care to attain patterns and trends. For this, we can use a big data analytics tool 'Apache Hadoop'. Hadoop is the upholding technology that's used in numerous healthcare analytics platforms. This is because Apache Hadoop is the accurate fit to manage the huge and tangled healthcare data and effectively deal with the difficulties anguishing the healthcare industry. Hadoop makes data warehouses less costly and more accessible. Hadoop provides doctors and researchers the chance to find insights from healthcare data sets that were before unidentifiable. Hadoop can store and manage a huge quantity of data which helps in all stages of analysis. Hadoop helps researchers find new trends and patterns in data sets with numerous variables, which is a problematic task for humans. Therefore, Apache Hadoop is considered the right platform to analyze big data from the healthcare system.

## **BENEFITS OF BIG DATA ANALYTICS IN HEALTHCARE:**

### **Smart healthcare system**

Big data analytics will improve the healthcare system by implementing virtual hospitals, telemedicine, effective doctor-patient interaction, and smart healthcare devices.

### **Eases patient diagnostics with EHRs**

This is the most widespread usage of big data in enabling productive patient diagnostics with every patient having their own electronic health records (EHRs). These EHRs include the demographics, medical history, and individual test results.

### **Error minimization and precise treatment**

Sometimes prescription errors serious problem in the healthcare organization. Big data can help reduce those errors rapidly by analyzing the patient's records with all treatments and correcting anything that seems out of place.

### **Ensures to reduce overall healthcare**

Healthcare providers can work the electronic health records (EHRs) which significantly helps to identify large patterns that lead to a lesser understanding of patient's health patterns. Various clinics, hospitals, and medical centers are frequently faced with high situations of loss of money, due to the ineffective handling of finances. Predictive analytics also enables hospitals and other healthcare facilities to save a large knob of their money by predicting the demand for medical supplies correctly. The volume that is saved can be

reinvested to yield advanced gains or used as another profit in the healthcare industry or individual healthcare organizations.

### **Enables improved healthcare with fitness devices**

Today, many people use fitness products or devices like smartwatches, which keep track of the physical exercise levels of the user. The data collected by all smart devices are sent to cloud servers, which are categorically being used by medical experts to understand the overall health of the user by analytical finding new trends and patterns from the data and can even plan for the user's medical treatment.

## **CHALLENGES:**

### **Implementation cost**

To adopt big data in healthcare, the expense is a considerable challenge. Hospitals will need to purchase technological devices, machines, related equipment, computational tools, and software to manage the data, and develop custom applications to benefit from big data analytics that will result in a financial crisis. Another item on the expenditure list is to hire data specialists on doing productive work.

### **Security**

Healthcare organizations should focus heavily on data security especially in the sudden data breaches, hackings, and fire. Also, ensure the antivirus software is up to date.

### **Cleaning and storage**

Data contamination can easily derail big data analytics projects, especially when combining data sources that may have slightly different formats for clinical or operational elements.

### **Image pre-processing**

Images of medical subjects often suffer from multiple types of noise and artifacts due to technical hurdles. When medical images are handled incorrectly, they can also be manipulated, for example, delineating anatomical structures such as veins, which is out of line with the real-life situation. In order to improve the quality of acquired images, noise reduction, artifact removal, contrast adjustment, and image quality adjustment can be made following mishandling.

**CONCLUSION:** The healthcare field is becoming a statistics-rich area with the increase in demand for big data. The information gathered in healthcare is primarily derived from diagnostic and treatment techniques. Furthermore, predictive modeling allows calculating future techniques and controlling plans precisely. In addition to control, massive information technology might also prevent a wide range of diseases. Traditional data analytics are limited in many ways and big data analytics will revolutionize healthcare. In conclusion, Big Data Analytics will likely have a positive impact on healthcare and have global implications.

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