

Review of Big Data In Healthcare Sector

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Abstract: The role of Big data analytics in healthcare is about collecting, analysing patient's data that has many dimensions and is complex to be understood by traditional approaches, in order to bridge this gap we need to come up with a technology that is able to meet up the day to day challenges in healthcare such as volume, velocity, variety, and veracity and should be able to capture and collect relevant data to produce suitable decisions when needed. Rapidly increasing healthcare industry demands better care management and with involvement of Big data in healthcare, the way of storing data and producing results has been drastically changed, it is now said that the more is Big data involved, the more efficient is healthcare. Therefore, it is the need of hour to focus on best opportunities to be generated using big data analytics, thus this paper reviews and discusses the recent evolvment, features, applications and trends in healthcare and presents various good projects currently working successfully. This Review also highlights the challenges associated with Big data analytics in healthcare and opens up the directions for future research work.

Keywords: Healthcare; Big data; Analytics; Six V's; data mining;

1. Introduction

An Information is defined as facts and figures which are raw and with the new developments in today's era, we are in a need to handle more and more information in an efficient manner. As the information increased, we need to organize it to deliver the best outcomes. This data further can also be used for predicting various parameters. With the growing set of population, the evolution of data and information is on exponential rate and this data is collected from almost every phase and aspect of our life like social media, education, health, work etc. The task does not end till collecting the data but to process and analyse the data in such a manner to produce meaningful decisions, reports and challenges out of it. This all lead to the development of term Big data which is referred as immense and capacious data sets that may be unstructured or structured. This huge amount of data is generated every day by productions and handlers. Big Data analytics is the method of groping the large data sets to underline visions and outlines. Adding more to this, the technological advancements have led to produce more and more such data which is giving a tough time to presently available technologies [4]. Proceeding with discussion of various applications of Big data Analytics like banking and securities, insurance, transportation, education, manufacturing, energy and utilities, media and entertainment and most importantly special social need which is healthcare [5].

Big data in Healthcare is comprised of 6 V's mentioned as [8]:

Volume: represents large data sets.

Variety: represents data collected from autonomous sources.

Velocity: represents speed of producing and handling the data sets

Veracity: represents accuracy of information.

Variability: represents fluctuation of data throughout the lifecycle of data.

Value: represents method of extraction of valuable information from large datasets.

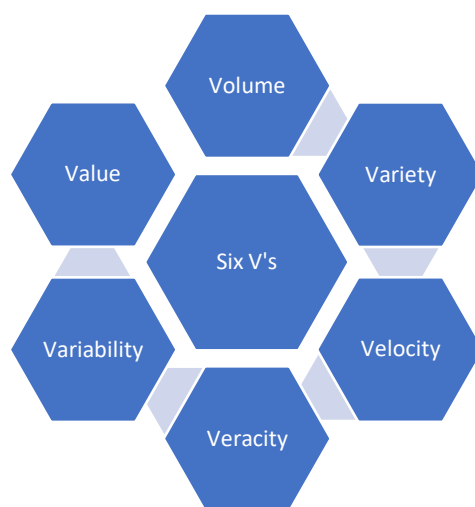


Figure 1. Six V's of Big Data

Advantages of Big data in healthcare:

- a. Creation of holistic, 360-degree view of patients, doctors and consumers.
- b. Study of patient profiles provides an understanding of better and improved care.
- c. Understanding of geographical areas where scope of healthcare with big data can be broadened.
- d. Measuring the performance and inter personal relationship between patients and doctors and preparing the improvement rate on the basis of type of treatment being provided to patients.
- e. On the basis of needs and preferences of doctors and patients, preparing a marketing strategy to boost the overall process.
- f. Measuring and optimizing the individual performance by analysing patient health improvement, patient satisfaction and growth of the hospital.[1]

2. Literature Review

Evolution of big data is a continuous process and medicalofficialdoms are generating data at incredible rate that boons many challenges, limitations and benefits at the same time. Discussion would befor the basic terminologies, tools and techniques used by

various researchers in various aspects of healthcare sector. The goal of this review is to study and investigate the tools which have helped in upliftment of healthcare sector. Review also provides a brief discussion about recent trends being followed.

Study of Big data in healthcare has been studied by various researchers, and the same have been published in recent times as well. Sunil Kumar and Maninder Singh [7] conversed the impact of big data in medical organizations by tools used in Hadoop ecosystem. He precisely discussed about health informatics which is effective to take care of bulky data generated and also helps to reduce cost, in addition to this he discussed about various applications based on Hadoop which are used for health industry. A study proposed by RevanthSonnati [6] titled as “Improving healthcare using big data analytics” presented the expenditure, economy and statistics of healthcare, however this paper showed the results based on only weak economic countries. Senthilkumar.et.al [8] shared the method of data analysis process in healthcare which mentioned five processes namely, Data Acquisition, Data Storage, Data Management, Data Analytics, and Data Visualization & Report, moreover author of this paper also suggested some tools that can be used for effective analysis process.

Reviews are based on timely exploration of trends in big data analytics and healthcare, differences between current trends and recent reviews has been shown in table 1 below

Table 1: Review of Big data in Healthcare

Paper Title	Discussion	Framework	Features & Outcomes
“Visualizing the knowledge structure and evolution of big data research in healthcare informatics” [12]	Paper surveyed on big data analytics in healthcare and medicine drew special attention to critical points.	Analysis of literature content and structure analysis	Data collected from multiple sources become problematic to be handled and stored.
“Big Data in Health Care: Using Analytics to	Discussed various ways to reduce cost in healthcare.	Predictive analytics	implications of policies for regulatory oversight, to handle privacy issues and

Identify and Manage High-Risk and High-Cost Patients” [13]			supporting of research analytics.
“Creating Value in Health Care Through Big Data: Opportunities and Policy Implications” [14]	Paper discussed about IT Infrastructure required for big data along with all aspects of security and privacy concerns.	Showcased Comparative studies of tools used like big data and visualization tools.	Implement big-data solutions by assigning the users that which user will be using the analysis and information provided by big data these solutions will help to reduce cost and implement improved quality.

3. Future Work

Future scope of big data analytics in healthcare as mentioned by a recent paper says that

If we familiarize prophecy of epidemics in reference to people’s health, provide warnings in advance for illness symptoms, and help discovering novel biomarkers and intervention of intelligent therapeutic strategies can improve the quality of life at a great extent. Issues like privacy and security of consumer/patient data needs to be protected from unauthorized users for proper analysis. [3]

Another important future aspect of big data in healthcare have been discussed in a paper which are as follows:

- (a) Analysis of heterogeneous big data in medical organisations: On the basis of heterogenous data, an analysis can be prepared to support therapy, diagnosis etc. Data for this analysis can be collected from either online (electronic records of medical/health records data/population data/healthcare given on internet) or offline or even both sources. This data should be accessed only from authorized centres to ensure security and privacy of data.[12]
- (b) Designing of understanding methodology for healthcare big data mining: To design an interpretation procedure which can address non-linear prediction functions for knowledge discovery in medical sector.[12]
- (c) Big data in civic health and aging study: Big data can collect data of various age groups and can provide an analysis of causes of various diseases and what drugs to use, early detection and prevention of the diseases. Elderly healthcare can be improved as well by predicting before time the diseases about to happen.[12]

- (d) Healthcare big data research using cloud: Cloud computing facilitates sharing of resources and provides better opportunities for researchers and scientists in healthcare analysis.[12]

In near future, as said by researchers there will be widespread implementation and practices of big data analytics of the healthcare. The Big data solutions could definitely save millions of lives and improve patient services.[10]

3. Conclusion

Out of all conclusions listed by various researchers, most of them agree on the point that, a powerful tool like big data analytics is very useful tool in healthcare, and the organisations following this would be reaping positive results specially in terms of expenditure [13].

The companies which provide services for healthcare analytics are indeed contributing towards positive outcomes. Common agenda for all these companies include reduction of cost for analytics, development of effective Clinical Decision Support (CDS) systems, to identify and prevent illegal activities in concern with big data, and almost all the research papers concluded on a point that privacy of user data is a challenge. The combined data from healthcare organizations and biomedical researchers have resulted in a better outlook, determination, and treatment of various diseases. This has also helped in building a better and healthier personalized healthcare framework [3].

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