

BIG DATA ANALYTICS IN HEALTHCARE

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ABSTRACT: A buzzword big data is used to recognize the datasets due to their large size and complexity. It is rapidly expanding in all areas such as science and engineering physical, biological and biomedical sciences. It is the collection of a large volume of structured and unstructured data. The big data evolution is from business applications, agriculture, healthcare, social media and sensor data and so on. The data in healthcare is increasing quickly and is expected to increase very much in coming years. Adoption of an evidence based approach of big data solutions will play a critical role in the outcomes of the healthcare industry and providing patient centric treatment. Big data analytics is an expanding area with the potential to provide useful insight in healthcare. With the big data and analytics tools and technologies predictive system will be designed to identify the increased risk. This paper describes big data analytics, characteristics, and potential and implementation of big data analytics in healthcare. It ends up with a survey of challenges and future directions in the healthcare sector.

Keywords: Big data, Analytics, Healthcare, Prediction system

1. INTRODUCTION

Big data analytics is the process of examining big data to uncover hidden patterns, unknown correlations and other useful information that can be used to make better decisions. By definition, big data in healthcare refers to electronic health data sets so large and complex that they are difficult to manage with traditional data management tools and methods. Big data in healthcare is overwhelming not only because of its volume but also because of the diversity of data types and the speed at which it must be managed [1]. Big Data is high velocity, huge variety high-volume, enormous velocity and high variety information assets in advanced forms of processing the information for greater intuition and decision making. The Big data analytics in healthcare primary objective is to support healthcare industries and to develop more knowledgeable decisions of patients' wellbeing and healthcare. This industry has generated large amounts of data such as physician's prescriptions and written notes, laboratory, medical imaging, pharmacy, patient data in electronic patient records, Electronic Patient Records (structured/unstructured), Genomics data like DNA sequences, social medias, webpages, mobility sensor data etc [2]. The opportunities of big data scientist are having huge amount of data. By discovering a new method for understanding and associations of patterns within a data is a big requirement in health care analytics. Thus, big data analytics applications in healthcare take advantage of the explosion in data to extract insights for making better informed decisions and as a research category [3]. There are some of the guidelines to improve health care analytics, includes finding and targeting the right people, delivering the right intervention at the right time and adjusting the

programs and closing the groups and to develop a new tools and techniques.

2. BIG DATA IN HEALTHCARE

The Big data in healthcare sector has accessing a huge amount of complex data. But it has overwhelmed by failures due to the truths of inadequate, unavailability of perfect electronic data. Apart from this those databases are holding the health related information are difficult to link data to other databases and devices to the field of medical [4]. So the patterns and information's are not able to show on time. As using the data to curb the cost of rising healthcare and by inefficient systems that stifle faster and better healthcare benefits across the board.

3. TYPES OF BIG DATA

Types of Big data in Healthcare are broadly classified into two categories:

- a) **Clinical Operations:** Clinical Operations refers to all the activities related to patients. It includes identification or diagnosing of disease, Monitoring the progress of disease, trauma and observations, treatments and reports about the patient treatments [5]. The Electronic Healthcare Records are useful for creating new patient principal of stratification and for illuminating unknown correlations of diseases.
- b) **Research and Development:** The Research and Development is placed a vital role in big data health care industry. It required 1) Statistical Algorithms and Tools: To provide quality treatments and to increase clinical trial designing. 2) Adaptive Clinical Trial: To evaluate a medical treatment or device by the observation of patient outcomes and changing the parameters of

the protocol trial in consensus with the previous observations. 3. Predictive Modelling: To produce more effective drugs and devices[6]. Apart from this R&D can contribute to

1. **Genomic Analytics:** Execute gene analysis and gene sequencing as a part of common decision process of medical care and to make more cost effectively and efficiently
2. **Evidence Based Medicine:** Analyse and combine a variety of unstructured and structured data like, electronic medical care records, financial and operational data, genomic data and clinical data to match treatments with better results, predict patients from unsafe diseases and deliver additional effective care[6].
3. **Patient Profile Analytics:** The patient profiles must be analysed using advanced techniques like predictive modelling and segmentation to identify the beneficiary of individuals because of proactive care. It would be more efficiently support for prevention of dangerous diseases[7].
4. **Remote Monitoring:** Capturing and analysing real huge volumes of real time fast moving data from home devices and hospitals for adverse event prediction and safety monitoring[8].
5. **Accelerating Discovery:** To improve trial operations for right innovation. It boosts the productivity, discovery and safety in R&D. The improved and better result in research and development areas are clinical decision support, cost effectiveness research, public health, remote monitoring system and personalized medicine[9]. Table:1 shows the summary of success findings of Big data in health care.

The correct innovation and proper decisions are giving better productivity in development, discovery and safety

4. IMPLEMENTATION OF BIG DATA Analysis

- a) **Disease eruption:** Big data analysis is used for monitoring of disease networking. An example is Google. Org's use of BDA to study the timing and location of search engine queries to predict disease outbreaks. As per research 75 percentage of consumers are currently using social

networking sites like, YouTube, Facebook, Google, blogs, Twitter for the purposes of health care[10]. As the demands of health information access from social networking sites continue to proliferate. It can potentially support programs for key prevention such as outbreak management and disease surveillance.

- b) **Question and answer:** The support of clinical decision research of united states provider organizations are turning to clinical informatics in an effort to prevent medical error. It indicates the percentage level is 79. The expect analytics to improve population health is 61 percentage, and analytics-driven preventive care will help rein in costs of 52 percentage It can potentially help to improve e-referral, scheduling and discharge of existing outcomes and workflow from business processes. BDA can also assist in providing insights around gaps in the continuum of care across settings and highlight best practices in care processes and clinical outcomes. Question and answer solutions integrated with computerized provider order entry, e-referral, edischarge and other process based activities can be used to analyse and predict trends in health care[11]. BDA can mine volumes of medical literature and other unstructured data and integrate these results with the increasing volumes of discrete data captured in EMRs, EHRs, and PHRs. BDA can combine evidence based data, content analysis through natural language processing technology can help for better understanding, learning for predict upcoming events and clinicians considerations for their decisions[12]. Data could be presented back in a meaningful way and encourage patient participation in their health care plans and potentially reduce re-admissions or adverse outcomes.
- c) **Heritage Health Price:** Using a historical claims of data to identify a patient's who can be admitted to a hospital because huge amount of money was unnecessarily spent for hospital admissions. The outcome of the above is health care providers can develop a new scheme to avoid high risk patient's needs. The combination of several predictive

Table 1: Summary of findings of Big data in Health care

Area of Inquiry	Benefits to Observed	Beneficiary
Transparency	Productivity Improvement	Patients
Clinical Decision Support	Lower Cost, Productivity Improvement, Increased Market share	Healthcare Providers, Patients
Cost Effectiveness Research	Lower Cost, Improving Productivity	Healthcare Providers, Patients
Public Health	Lower Cost, Improving Productivity	General Public Transportation Providers, Patients.
Remote Patient Monitoring	Lower Cost, Easy to use	Healthcare Providers
Personalized Medicine	Improving Productivity	Patients

models may give a good success in Big data health care sector.

- d) **Genomics and Personalized Care:** Personalized care is being presented as the next wave of transformation in the delivery of medical treatment to patients. The world's largest set of data on human genetic variation – produced by the international 1000 Genomes Project – is now freely available on the Amazon Web Services (AWS) cloud. At 200 terabytes – the equivalent of 16 million file cabinets filled with text, or more than 30,000 standard DVDs – the current 1000 Genomes Project dataset is a prime example of BD, where datasets become so massive that few researchers have the computing power to make the best use of them. AWS is storing the 1000 Genomes Project as a publicly available dataset for free, and researchers will pay only for the computing services they use[13].

The open health data are supporting health innovation. The Potential examples of uses include interactive health maps on the web that allow peoples to understand health performance and issues in their area versus other areas with incredible ease and clarity. Social networking applications that allow health improvement leaders to connect with each other to share best practices, compare performance, and challenge each other to improve health performance and educate people about community health.

5. CHALLENGES AND FUTURE DIRECTIONS

The healthcare providers are having the potential to improve insight from physicians and other data sources to develop and take conversant decisions using the sophisticated technologies. The types of challenges are varying depends upon the requirements. Scientific Challenges, Regulatory Challenges, commercialization Challenges, Data Challenges, Translation Challenges. The common challenges of health care industry's include extracting the useful information from medical imaging data, analysing genomic data, patient's behavioural data capturing through sensor's is a computationally intensive task. The common issues in health care industry faces privacy, security safeguarding, establishing governance and standards. So the big data analytics in health care requires the development of emergent stage of tools and technologies to assist right decision on right time. This several challenges need to be addressed in future.

6. CONCLUSION

Big data analytics is a promising right direction which is in its infancy for the healthcare domain. Healthcare is a data-rich domain. As more and more data is being collected, there will be increasing demand for big data analytics. Unravelling the Big Data related complexities can provide many insights about making

the right decisions at the right time for the patients. Efficiently utilizing the colossal healthcare data repositories can yield some immediate returns in terms of patient outcomes and lowering care costs. Data with more complexities keep evolving in healthcare thus leading to more opportunities of big data.

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