

Benefits of Big Data in Health Care: A Revolution

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ABSTRACT

Lifespan of a normal human is increasing with the world population and it produces new challenge in health care. big data change the method of data management, leverage data and analyzing data. with the help of big data we can reduces the costs of treatment, reducing medication and provide better treatment with predictive analytics. Health related data collected from various sources like electronic health record (EHR), medical imaging system, genomic sequencing, pay of records, pharmaceutical research, and medical devices, etc. are refers to as big data in healthcare.

KEYWORDS: Big data, Analytics, Healthcare

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INTRODUCTION

The swift development of the upcoming information technologies, experimental technologies and methods, cloud computing, the Internet of Things, social networks supplies the amounts of generated data that is rising immensely in many research fields. Big data is starting to revolutionize the health care industry. The change in treatment technology, pharmaceutical technology, reducing medication, and helping to provide better treatment.

Data is a powerful resource which is found in many forms. Big data do not have a universal definition while it is discussed in different ways. The term Big data is referred to describe the exponential growth of the data flow in various sectors which is too large to process using the available traditional database and software techniques. Often big data is presumed to be scary, yet it is an explosion in the field of information. It helps to perform various analytics, which can make an impact on the economic growth, creating opportunities, improving efficiency over other organizations. The term big data is described by the following characteristics: *value, volume, velocity, variety veracity and variability*, denoted as 6 "Vs", shown in Figure 1.

Volume: Data volume is a contribution by various factors. It can be transactional data, which is being used through the years, or the data flow over the social media. The volume of the data is the total quantities of the mass data within an organization. The volume of data generated in an organization increases daily at an unpredictable rate, which can be in petabytes and zeta bytes on the production activities and the type of the organization.

Velocity: This refers to the data in the total data transmitted currently in an organization or in motion. The speed of the data that an organization produce process and analyzes normally keep on accelerating. It influences the creation and delivery of the data from one point to the next. It is often time-sensitive.

Variety: The variety, which is diverse in forms, type of data and its origin. It defines the complexity of the data, and the Occurrences of data. It is in any form like structured, semistructured and unstructured data. Some forms of structured data are the Numerical data, traditional databases, business information and unstructured data like Audio, Video and Pictures.

Veracity: Veracity, which is composed of the data that the organization is uncertain. It analyzes levels of forms of data credited on reliability. Organizations enactment of strategies to ensure quality and reliable data is normally hindered by factors such as weather and customer's reactions and purchasing decisions.

Variability: Variability refers to data fluctuations throughout the handling and lifecycle. Developing range and variability also grows the attraction of data and the possibility in providing valuable information, unforeseen, and hidden [20]. Value is the method of extracting valuable information from huge sets of data and it is usually referred to as big data analytics. Data value is useful for proper making decisions.

Value: value of the big data refers to their coherent analysis, which should be valuable to the patients and clinicians.

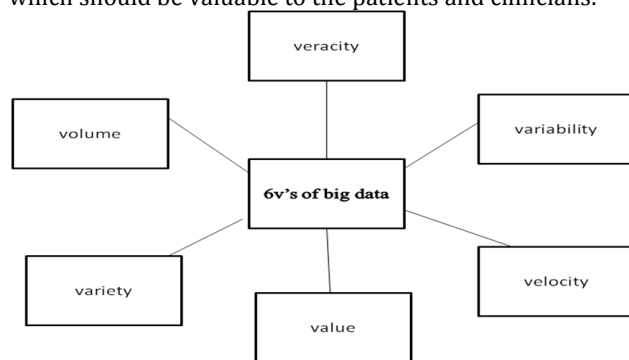


Fig: 1

BIG DATA IN HEALTHCARE

Defining the volume of the data, the type of data, and the entity limitations are very wide. Combining the complete health care data is very large, which refers as –big data|| but not as huge, as we think that the organization cannot handle its data. Most of the healthcare providers have not faced any harder situation to handle the data for them; however, it is always good to foresee the technology improvements and implementation, which can help them. According to the McKinsey Global Institute, better targeting of preventative healthcare messages to the right population at the right time could save \$70-100 billion 0 . As a result, Hadoop data processing is the one of the best choice to go with at the current trends. The computational capabilities of Hadoop processing will be able to stimulate the mathematical methods available currently, medical research approaches to increase the outcome quality. Although big data might not be their case, but the discovery process to find new techniques to analyze the data they have, increase the accuracy of the experimental results, provide various mechanisms to find the quality of data is always at the highest priority. As a result, Hadoop data processing is the one of the best choice to go with the current trends. The computational capabilities of Hadoop processing will be able to stimulate the mathematical methods available currently, and medical research approaches to increase the outcome quality. –Most of the data systems are for billing, and they aren't used to improve the quality of care,|| explains Jason Jones, executive director for clinical intelligence and decision support at Kaiser Permanente, a health care provider and notfor-profit health plan that serves approximately 9.1 million members in 8 states and the District of Columbia 0 . The emerging generic health care systems usually save and manage EMR (Electronic Medical Record), PHR (Personal Healthcare Record) 0 , Laboratory Information System (LIS), biomedical data, biometrics data, and genomic data 0 which can be the invaluable sources to generate the outcomes. These various data sources help to process and analyze the data with various characteristics. Processing such massive data sets using the Hadoop technology will helps us not only to process quickly compared to the traditional database solutions which are being used currently, but also provides an extra edge to analyze the data characteristically.

Applications of Big Data in Healthcare:

Big data can be applied in almost all the areas of healthcare management. The potential application areas are fraud detection, epidemic spread prediction, Omics, clinical outcome, medical device design, insurance industry, personalized patient care and manufacturing, and

pharmaceutical development etc. Moreover the application of big data is widely adopted in personalized healthcare which offers an individual centric approach .

Big Data in 'Omics':

"Omics" data refer to significant datasets in the organic and molecular fields (e.g., proteomics, metabolomics macrobiotics, genomics etc.). Application of big data on this study is to realize the strategies of diseases and increase the specification of medical treatments (e.g. "precision medicine") . With the advance in metabolomics, proteomics, genomics, and other types of omics know-hows through the previous eras, a remarkable volume of data associated to molecular biology has been formed. Genomics is the study of genes and their functions. Application of big data in genomics will help to prevent or cure diseases and delivering personalized care to each patient. This area is in still emerging period with presentations in particular concentrated regions, for example leukemia, diabetes, and cancer . Pathway analysis is mostly used for high-quantity of genome-scale data , there are three generations of same structures used in pathway analysis. The first generation tools are Clue Go, Onto-Express and GoMiner . The most popular tool for second generation is GSEA, and the example for the third generation tool is Pathway-Express. Proteomics is the study of proteome on their structures and functions. A proteome is the entire set of proteins in a cell. ExPASy (<http://www.expasy.org/proteomics>) lists dozens of databases on proteomics and over 100 tools. Big data application in proteomics, will have a major role in predicting and preventing human cancer. Find Mod and CSS-Palm are frequently used for PTMs prediction. Metabolomics is the systematic concept of chemical procedures including metabolites. The database BiGG used Genomic-based reconstruction of human metabolism for systems biology.

Insurance Industry / Payer:

Healthcare Insurance companies/ payers are using big data in underwriting, fraud deduction, and claim management. Insurance providers are observing further than algorithmic fraud revealing practices that are claim-centric, to ones that are person-centric. For example how many related claims were been submitted by the same personality or stated the identical treatment in different insurance companies.

Medical Device Design and Manufacturing:

Big Data implement facilitates a wider set of device materials, delivery methods, and tissue interactions, anatomical configurations to be evaluated. Calculation techniques and Big Data can plays a significant role in medical system strategy and manufacturing.

Pharmaceuticals:

Big data is used during all phases of pharmaceutical development, particularly for drug discovery. Pfizer has recently initiated Precision Medicine Analytics Environment program that associates the dots among electronic medical record data, clinical trial, and genomic to identify chances to rapidly convey innovative medicines for particular patient populations.

Personalized Patient Care Healthcare:

Big Data will make possible to bring best and modified patient care. In nearby future, fresh big data-derived influences will prompt suitable updates of diagnostic assistance, clinical guidelines and patient triage to permit

more particular and modified treatment to advance medical result for patients

Privacy and security

Two important issues towards big data in healthcare and medicine are security and privacy of the individuals/patients. All medical data are very sensitive and different countries consider these data as legally possessed by the patients. To address these security and privacy challenges, the big data analytics software solutions should use advanced encryption algorithms and pseudo-anonymization of the personal data. These software solutions should provide security on the network level and authentication for all involved users, guarantee privacy and security, as well as set up good governance standards and practices.

Conclusion and future work

Big data analytics in medicine and healthcare is very promising process of integrating, exploring and analysing of large amount complex heterogeneous data with different nature: biomedical data, experimental data, electronic health records data and social media data. Integration of such diverse data makes big data analytics to intertwine several fields, such as bioinformatics, medical imaging, sensor informatics, medical informatics, health informatics and computational biomedicine. As a further work, the big data characteristics provide very appropriate basis to use promising software platforms for development of applications that can handle big data in medicine and healthcare. One such platform is the open-source distributed

data processing platform Apache Hadoop MapReduce that use massive parallel processing (MPP). These applications should enable applying data mining techniques to these heterogeneous and complex data to reveal hidden patterns and novel knowledge from the data. Recent hardware innovations in processor technology, newer kinds of memories/network architecture will minimize the time spent in moving the data from storage to the processor in a distributed setting.

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