INTERNATIONAL RESEARCH JOURNAL IN ADVANCED ENGINEERING AND TECHNOLOGY (IRJAET) E - ISSN: 2454-4752 P - ISSN : 2454-4744
VOL 4 ISSUE 3 (2018) PAGES 3554 – 3559
RECEIVED : 05.04.2018 PUBLISHED : 10.05.2018
May 10, 2018

Review of Big Data Technologies in Healthcare

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ABSTRACT

With the expanded need on exact and precise surgical techniques alongside definitely no space for blunders, the world of healthcare is inclining towards various digitized strategies and innovations. This represents an issue as the information to be handled successfully is coming at us in numerous way. The test is to comprehend the unremarkable crude information unambiguously and mistake free. Areas like Big Data and AI could help take care of the issue of unstructured information by sifting and investigation, which would be of high an incentive to the surgical professionals and the general population associated with medicinal services. Utilizing these advances, expectations of enormous exactness and accuracy can be made in instances of surgery and conclusion. The part of big data in healthcare is one where we can make better successful profiles and better predictive models around particular patients with the goal to treat patients and help in the smooth transition from diagnosis to treatment.

1. INTRODUCTION

Big Data: Broad information that is difficult to accumulate, store or process inside the conventional systems is named as big data. Big data is used to portray data that is high volume, fast, and high collection. It requires latest, advanced methodologies to catch, store, and separate hoping to overhaul fundamental administration, give comprehension and revelation. Volume projects the measure of data imparted in terabytes and, petabytes of data. There are various types of unstructured data such as substance, video, sound, click streams, 3D data and log records.

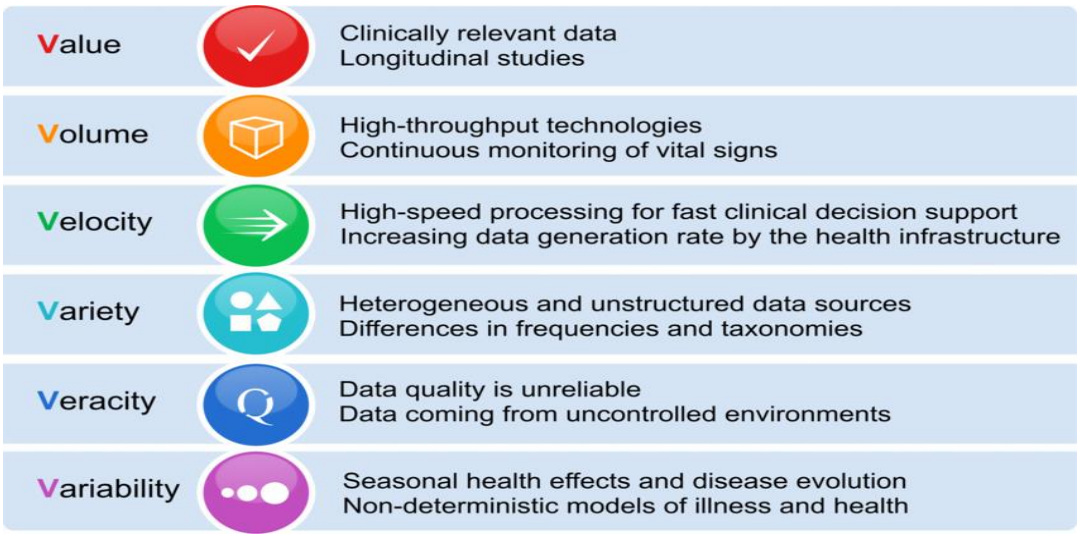

Figure 1.1 Six v's of big data

Velocity projects the speed in which data streams from PDAs, click websites, highly recursive stock trading, and system to system frames are gigantic and incessantly fast.Big data Analytics help solve problems such

as hidden patterns, mysterious relationships, and other business-related information using various big data tools that can analyse better than other tools that analyse data. Many organization are using latest big data technologies and systems such as Hadoop, MapReduce, Hadoop Hive, Spark, Presto, Yarn, Pig, NoSQL databases and others to aid them solve problems in big data.Big data can help support the suitability of clinical research considers from other certifiable situations, where an element such as population heredity is restrictive in nature. It also helps provide the ways for real, efficient and tailor-made care for a patient by performing patient classification. This is very important step ahead to provide tailored healthcare. A superior utilization in medicinal assets methods for personalization can prompt very much oversaw wellbeing administrations that can beat the difficulties of a quickly growing populace. In conclusion, future has a good room of big data analytics in healthcare, bioinformatics, sensing, and imaging will have a great impact on future clinical research. Added crucial aspect to take into perspective is swift and continuous health data collection, thereby giving rise to various feats of big data in the healthcare industry. Especially, sensing gives us a good set of solutions to cover this breach. Occurrences of health data obtaining also include a moderate and difficult processes that include retrieving information from uncommon health individual and research facilities.

2. IMPACT OF CURRENT BIG DATA TECHNOLOGIES IN HEALTHCARE

The current technologies are helping the healthcare industry in many ways:

- Reducing Fraud.
- Reducing readmission rates.
- Minimizing overhead.
- Improving healthcare product design.

While there were several advantages of this system, they had a few limitations:

- Weighted averages for Actuarial models.
- Difficulty assessing doctor performance.
- Data Availability and reliability.

Big data is changing the eventual fate of medicinal services in numerous uncommon ways. However, there are still limitations that healthcare providers need to overcome.

Healthcare suppliers need to put more in big data, yet they should likewise be reasonable about the confinements. Providentially, a considerable lot of these difficulties will be tended to sooner rather than later.

3. BACKGROUND WORK

- **Google Flu Trends(GFT):** a service that was initiated by google that makes predictions and locates epidemics of the flu by using information aggregate search queries.

- The San Francisco-based **Global Viral Forecasting Initiative** (GVFI) uses advanced analytics on information mined from the Internet to distinguish completely the areas, sources and drivers of neighbourhood flare-ups before they become global epidemics**.**

- Analysis of mobile and Internet data could prompt colossal open increases and social welfare.

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- **IBM Watson:** Health has been the first zone of business utilization of this innovation for IBM. Watson's capacity to understand questions and setting, and to rifle through 200 million pages of information and give precise responses in just seconds, can help a physician treating a patient to consider every related content, reference materials, earlier cases, and the latest learning in journals and medicinal writing.

- **Accenture** targets the 4% incessantly sick patients that tie up over 60% of the hospital resources Through a service that monitors the constantly sick patients that can inhabit home, maintaining a strategic distance from readmission to hospital.

- **IBM**, through their 'Smarter Cities' initiatives, has given support to home care of recurrently ill patients (example Stavanger Hospital in Norway)**.**

- Department of Health in Hong Kong modernized its examination to interface a wide range of frameworks for a superior stream of data after the SARS episode of 2003. The department can recognize problem areas to conjecture where disease is probably going to spread straightaway. The division is presently better arranged to battle the following health crises, including a later flare-up of Dengue fever. Similar approaches are presently being utilized the world over.

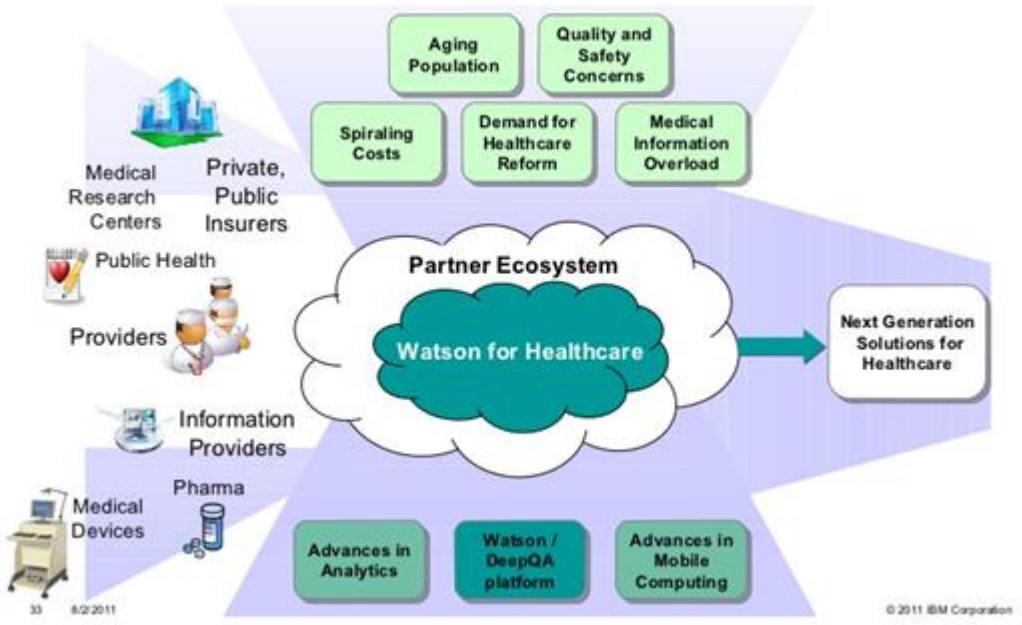

Figure 4.1 IBM Watson

4. COMPARATIVE STUDY AND ANALYSIS

Health informatics applications are known to generate data sets that are complicated to store, untangle, organize, process, and, above all, interpret. From a scientific perspective, studies with a limited cohort of patients and controls can only serve as a proof-of-concept for future treatments and diagnoses In this seminar we are going to compare and analyse some organizations that implement big data analytics in healthcare

from the organizations and provide individual patient care. The complexity, diversity, and rich context of data being generated in healthcare are driving the development of big data for health. Volume, velocity, variety, veracity, variability, and value are the "VI's" of big data, and these are exemplified in the inherent difficulties of biomedical and health informatics. Effective ways of tackling these challenges would pave the way for more intelligent healthcare systems focused on prevention, early detection, and personalized treatments.
This data can be used for making future clinical decision. Depending on the data provided, the patient medical condition, if it is a genetic one, it can be detected at the early stages and can be either prevented or taken care of.

Google flu trends was an initiative to use the huge of data available to predict an outbreak. They used the queries that people used from a particular location and identify the outbreak of the flu. Be that as it may, Google's calculation was very helpless against overfitting to occasional terms irrelevant to influenza. While Google's endeavours in anticipating this season's flu virus were good natured, they were surprisingly hazy as far as technique and data—making it perilous to depend on Google Flu Trends for any basic leadership. The data that clients give may be extremely significant to them which puts them in danger.

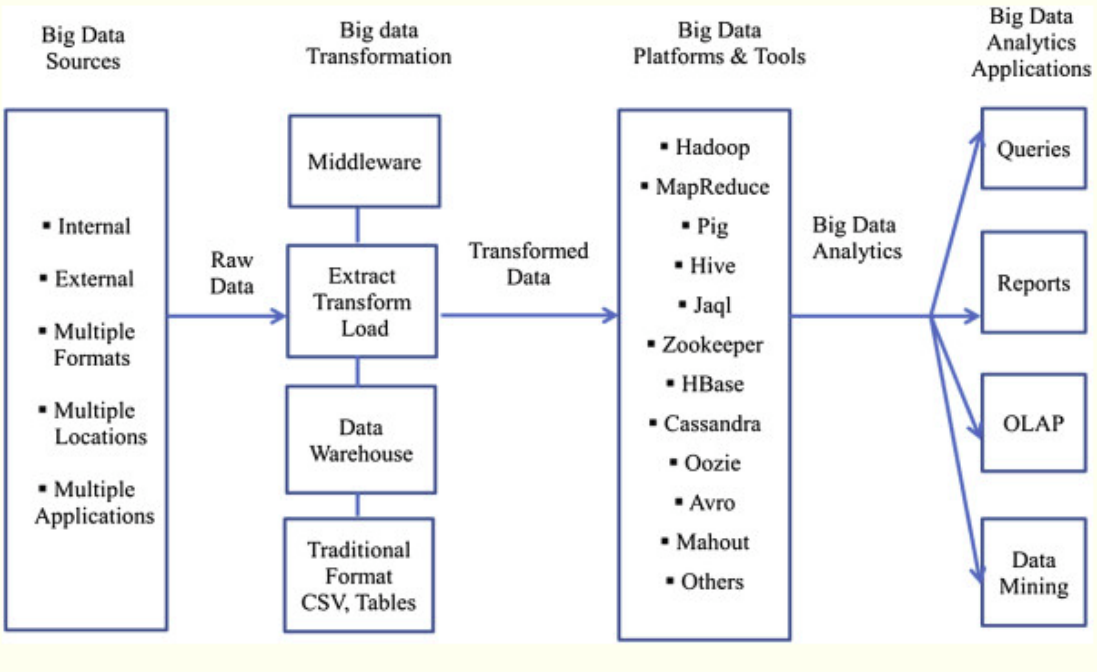

Figure 5.1 Applied conceptual architecture of big data analytics

Big Data technologies could help to provide more effective tools for behavioral change. Especially **Mobile Health** (mHealth) has the potential to personalize interventions, taking advantage of lifestyle data (nutrition, physical activity, sleep) and coaching style effectiveness data from large reference populations. Besides providing information to people, mHealth technologies exploit contextual information which is the key to personal. This can help provide a fully integrated picture of what influences progress and setbacks in therapy.

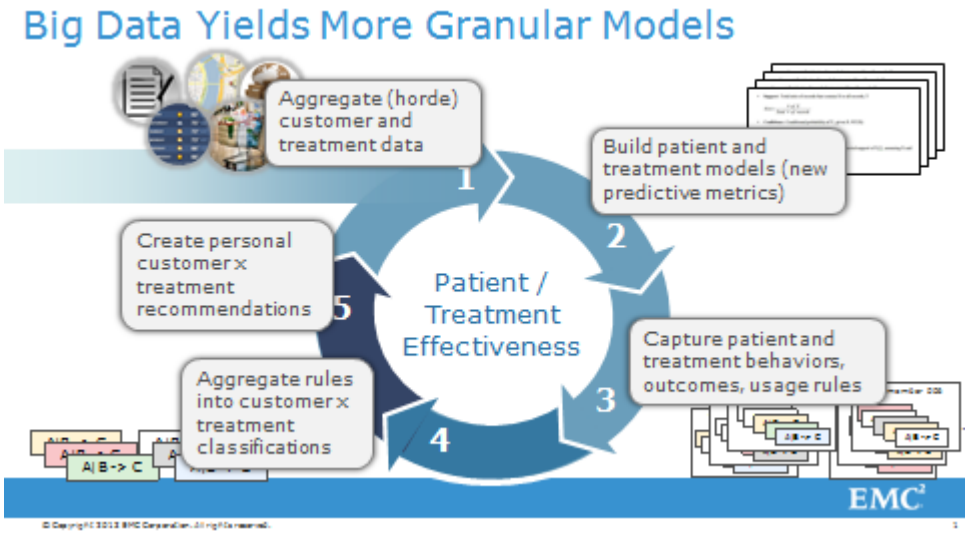

Figure 5.2 Big data model around patient

Technical Challenges faced by the organizations and how they can overcome that:

- Data Quality:
  There is a need to have reliable and reproducible results particularly in medical and pharmaceutical research where data gathering is extremely expensive. Data provenance provides an understanding of the source of the data – how it was collected, under which conditions, but also how it was processed and transformed before being stored. This is important not only for reproducibility of analysis and experiments but also for understanding the reliability of the data that can affect outcomes in clinical and pharmacological research. As the complexity of operations grows, with new analysis methods being developed quite rapidly, it becomes key to record and understand the origin of data which in turn can significantly influence the conclusion from the analysis.
  This can be overcome by using machine learning and AI to verify the veracity of the data.

CONCLUSION AND FUTURE SCOPE

In conclusion, the sources and computational methods for big data are quickly expanding and the conceivable uses for enhancing health and prosperity are increasing. For healthcare, the objective is to furnish a constantly learning foundation with continuous information creation and to build up a framework that is deterrent, predictive, and participatory. Big data analysis plainly can possibly enhance healthcare and change the health of many who are struggling to find the right treatment. Be that as it may, effectively misusing this potential will rely upon explaining challenges related with data protection, security, ownership, and administration.

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