Big Data: An Overview to Applications in Health Sector

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Abstract

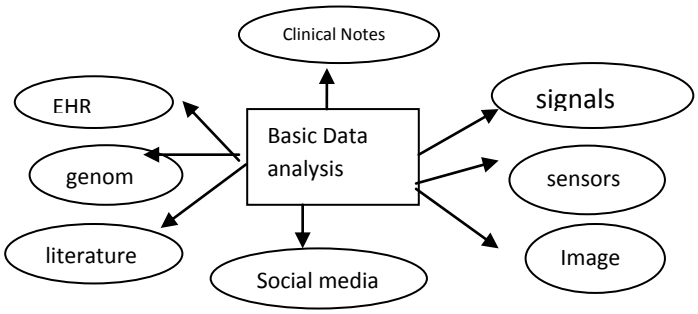
In this paper we are discussing some applications of data science in health sector and also some future trends of this field in this sector.

I. INTRODUCTION

Diagnose of a patient is always a study of data, While the healthcare costs have been constantly rising, the quality of care provided to the patients in India have seen considerable improvements. Recently, several researchers have conducted studies which showed that by incorporating the current health care technologies, they are able to reduce mortality rates, healthcare costs, and medical complications at various hospitals. A recent report on Big Data suggests that the overall potential of health care data will be much higher than present level. Due to the rapid advancements in the data sensing and acquisition technologies, hospitals and healthcare institutions have started collecting vast amounts of healthcare data about their patients. Effectively understanding and building knowledge from healthcare data requires developing advanced analytical techniques that can effectively transform data into meaningful and actionable information. General computing technologies have started revolutionizing the manner in which medical care is available to the patients. Data analytics, in particular, forms a critical component of these computing technologies. The analytical solutions when applied to healthcare data have an immense potential to transform healthcare delivery from being reactive to more proactive. The impact of analytics in the healthcare domain is only going to grow more in the next several years. Typically, analyzing health data will allow us to understand the patterns that are hidden in the data. Also, it will help the

clinicians to build an individualized patient profile and can accurately compute the likelihood of an individual patient to suffer from a medical complication in the near future. Healthcare data is particularly rich and it is derived from a wide variety of sources such as such as sensors, images, text in the form of biomedical literature/clinical trials, notes, and traditional electronic records. This heterogeneity in the data collection and representation process leads to numerous challenges in both the processing and analysis of the underlying data. There is a wide diversity in the techniques that are required to analyze these different forms of data. In addition, the heterogeneity of the data naturally creates various data integration and data analysis challenges. In many cases, insights can be obtained from diverse data types, which are otherwise not possible from a single source of the data. It is only recently that the vast potential of such integrated data analysis methods is being realized.

Big data in health informatics can be used to predict outcome of diseases and epidemics, improve treatment and quality of life, and prevent premature deaths and disease development [1]. Big data also provide information about diseases and warning signs for treatment to be administered [1,2]. This will help not only to prevent co-morbidities and mortality but also assists government to save the cost of medical treatment [1,3]. It is very useful not only in clinical medicine for diagnosis/detection but also in epidemiological research as the big data will provide huge amount of data. The government, non-governmental organization and/ or pharmaceutical companies can use the data to formulate policies, strategies, intervention or medical treatment such as drugs development. Big data has implications on healthcare on patients, providers, researchers, health professionals [4]. To describe the promise and potential of big data analytics in healthcare. Here, we are describing some the nascent field of big data analytics in healthcare, discusses the benefits, outlines a methodology, briefly discusses the challenges. The study may provides a broad overview of big data analytics for healthcare researchers and practitioners. Big data analytics in healthcare is evolving into a promising field for providing insight from very large data sets and improving outcomes while reducing costs. Its potential is great. We are giving here some figure for indicating its importance in various ways.



Healthcare analytics refers to the systematic use of health data and related business in sights developed through applying analytical, e.g. statistical, contextual, quantitative, predictive, cognitive, and other models, to drive fact-based decision making for planning, management, measurement, and learning in healthcare. Big data analytics has the ability to go beyond improving profits and cutting down on waste, to be able to predict epidemics, cure diseases, improve the quality of life and reduce preventable deaths. Among these applications, predictive analytics is believed to be the next revolution both in statistics and medicine around the. Predictive analytics involves using empirical methods (statistical and other) to generate data predictions as well as methods for assessing predictive power. It uses a variety of statistical techniques such as modeling, machine learning, and data mining that analyze current and historical data to make predictions about the future. For instance, predictive analytics could be used to identify high-risk patients and provide them treatment to reduce unnecessary hospitalizations or readmissions. As noted above, big healthcare data analytics presents great potential for transforming healthcare, yet there are manifold challenges ahead. These challenges include not only technological hurdles but also organizational, social, economic, and policy barriers that accompany the application of analytics to big healthcare data. On the technological front, challenges include integrating and/or analyzing various forms of healthcare data to address impending problems. In terms of organizational barriers, prior studies have reported how organizations. Healthcare professionals may resist the introduction of technologies that facilitate data capture for analytics but change their work processes. Additionally, social issues, such as privacy concerns, surround the use of new technologies such as wearable that enable personal data analytics. Economics scholars, on the other hand, are concerned about how these technologies and analytics outcomes may impact healthcare costs for various stakeholders. Finally, technologies that allow healthcare data capture and analytics entail policy implications such as changes in privacy and data protection laws. These myriad challenges around the use of technology for big healthcare data analytics present a fertile ground for IS researchers of technical, behavioral/organizational, and economics streams.

With an extreme data distribution we will be challenged to provide the services we have come to expect with massive centralized data storage. Those challenges are surely not insurmountable, but will take considerable research, innovation, and software development to deliver. The first challenge presented then becomes one of appropriately partitioning big data (eventually massive extreme distributed data), to identify behavioral groups within which we learn, and to even model and learn at the individual level. The second challenge is to refocus again on delivering learning algorithms that self-learn (or self-modify) in realtime, or at least at the right time, and to do this online. Finally, how do we deliver this in the context of extreme data distribution where the database records are now distributed far and wide and are privacy protected, and how we might deliver learning agents that look after the interests of their "owner".

II. COMMUNICATIONS GAP

The miscommunications or the gap between the users and data scientists is one of the biggest problems in relations to big data. The understanding of the users on data generated by data scientists' maybe low and this may affect the effective usage of big data. The health data from all clinics and hospitals need to be pooled together as stored at one-stop centre (big data). At the moment, all the information are kept separately. As such, it is difficult to get a clearer picture of the patients due to the incomplete information gathered. Thus, this waste a lot of time as the doctor will need to start all over from the beginning taking the patients history. Since big data has the ability to predict future medical issues which is a positive thing, big data can also pose risk and undermine doctors. The patients too will rely on the technology rather consulting the healthcare practitioners.

III. DATA NATURE

The integration of data will not only involve data within the healthcare system but also external data. Although it gives potential benefits, it is also challenging in terms of privacy, security and legal matters. The healthcare data usually consists of patients who are seeking treatment in the hospitals or clinics but none on healthy individuals. With the inclusion of healthy individuals in the database, it will help to provide better understanding on the nature of the disease and intervention [9]. As the data becomes more current, it is necessary that the information are passed to the users immediately for clinical decision making and to improve the health outcomes.

IV. CONCLUSION

Big Data has a great potential changing the healthcare outlook such as in drug discovery, patients personalization care, treatment efficiency, improvement in clinical outcomes, and patients safety management.

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