Chapter 72
Computational and Data Mining Perspectives on HIV/AIDS in Big Data Era: Opportunities, Challenges, and Future Directions

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ABSTRACT

HIV/AIDS big data analytics evolved as a potential initiative enabling the connection between three major scientific disciplines: (1) the HIV biology emergence and evolution; (2) the clinical and medical complex problems and practices associated with the infections and diseases; and (3) the computational methods for the mining of HIV/AIDS biological, medical, and clinical big data. This chapter provides a review on the computational and data mining perspectives on HIV/AIDS in big data era. The chapter focuses on the research opportunities in this domain, identifies the challenges facing the development of big data analytics in HIV/AIDS domain, and then highlights the future research directions of big data in the healthcare sector.

INTRODUCTION

Recent quick raise within digital data's generation as well as the quick development concerns computational science permit us extracting recent insights from the massive sets of data, recognized as huge data, within a variety of disciplines, involving internet finance and business (Lee & Yoon, 2017; Lane et al., 2014).In the area of healthcare, discovering recent actionable insights has not been recognized widespread, even though many success achievement stories are mostly published in the academic journals and media (Edmunds et al., 2014). This postponed development of the big data technology in the sector of healthcare is unusual, taken into account a previous prediction, which is the big data technology's

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application that was predictable. In addition, the sector of health care could be one of the most important sectors predicted to be profited the most from the technology of big data (Murdoch & Detsky, 2013).

The growing gap among outcomes and healthcare costs is recognized as one of the most significant issues and there are many efforts under way in order to fill this gap within several developed countries (Savel & Foldy, 2012). It is demonstrated that the gap among outcomes and healthcare costs was analyzed in order to consider the poor management's result of insights from the research. The poor use of obtainable evidence, in addition to the poor imprison of care experience, each of which contributes to lead to wasted resources, missed chances in addition to possible harm to the patients (Curry, 2005). It has been proposed that the gap could be defeated through the improvement of a "continuous learning healthcare system" since an honorable cycle is shaped among the research as well as the healthcare's arms, and data could be utilized successfully (Rumsfeld, Joynt & Maddox, 2016). Consequently, an imperative demand to enhance patient outcomes and healthcare quality, developing the availability of data in addition to improving analytic capabilities are the big data era's drivers of healthcare (Rumsfeld, Joynt & Maddox, 2016; Groves et al., 2016). There are several challenges to defeat before the technology of big data has the ability to considerably enhance healthcare outcomes, quality and healthcare.

THE ERA OF BIG DATA IN THE DOMAIN OF HEALTHCARE AND MEDICINE

The Concept of Big Data

The "Big Data" term was first initiated into the computing world through Roger Magoulas from the publication of O'Reilly in 2005 to identify a huge amount of data, which the techniques of conventional data management cannot process and process because of the size and complexity of this data (Ularu et al., 2012; Chaorasiya & Shrivastava, 2015). A conducted study on the development of Big Data as a Scientific Topic and Research indicates that the "Big Data" term was offered in the starting of research with1970s; however, has been encompassed within the publications in 2008 (Halevi & Moed, 2012; Sharma, Joshi &Manisha, 2015).

Each day, we generate 2.5 quintillion bytes of data — so much that ninety percent of the data within the world nowadays has been generated in the most recent two years only. This data arrives from each place: sensors utilized to collect climate information, place to the site of social media, videos and digital pictures, phone GPS signals in order to name a few and purchase transaction records (Mukherjee & Shaw, 2016; Jewell et al., 2014). Such massive amount of data which is being formed incessantly is what has the ability to coin as Big Data (Mukherjee & Shaw, 2016).

The decodes of Big Data formerly undamaged data in order to obtain recent insight that is incorporated into the operations of business. Nonetheless, because the amounts of data develop exponential, the recent methods are becoming outdated. Dealing with Big Data entails widespread skills of coding, statistics and domain knowledge. In spite of being Herculean within nature, the applications of Big Data are approximately ubiquitous- from the research of marketing into the scientific research to the interests of customer and so on. We have the ability to witness Big Data within action approximately every place these days (Sabia & Kalra, 2014; Kaisler et al., 2013).

In excess of a year ago, the World Bank prepared the first Innovation Challenge of WBG Big Data that promote many distinctive ideas concerning Big Data like big data in order to expect poverty as well as for climate smart agriculture and for user concentrated Identification of Road Infrastructure Condi-