Chapter 1
Overview of Big Data and Its Visualization

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ABSTRACT

Big Data is data sets that are so voluminous and complex that traditional data processing application software are inadequate to deal with them. This chapter discusses what Big Data is and its characteristics, and how this information revolution of Big Data is transforming our lives and the new technology and methodologies that have been developed to process data of these huge dimensionalities. This chapter discusses the components of the Big Data stack interface, categories of Big Data analytics software and platforms, descriptions of the top 20 Big Data analytics software. Big Data visualization techniques are discussed with real data from fatality analysis reporting system (FARS) managed by National Highway Traffic Safety Administration (NHTSA) of the United States Department of Transportation. Big Data web-based visualization software are discussed that are both JavaScript-based and user-interface-based. This chapter also discusses the challenges and opportunities of using Big Data and presents a flow diagram of the 30 chapters within this handbook.

WHAT IS BIG DATA?

Big Data is defined as collections of datasets whose volume, velocity or variety is so large that it is difficult to store, manage, process, and analyze the data using traditional databases and data processing tools (Bahga & Madisetti, 2016). According to an estimate by IBM, 2.5 quintillion bytes of data is created every day, and that 90% of the data in the world today has been created in the last two years alone (IBM, 2017).

In 2012, United States (US) government committed $200 million in "Big Data" research and development investment (The White House, 2012). Big Data application is estimated worth $300 billion dollars for the US health care industry, and $250 billion euros for the Europe's public section administration

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(Manyika, Chui, Brown, Bughin, Dobbs, & Roxburgh, 2011). So what is Big Data? The numerical definition of Big Data is evolving with the development of the technology. A dynamic definition is that data which exceeds the capacity of commonly used hardware and software tools to capture, store and analyze within a tolerable elapsed time is considered as Big Data (Franks, 2012). Clegg (2017) authored a book on how the information revolution of Big Data is transforming our lives.

According to Marr (2016), Big Data in practice includes such as for Walmart: How Big Data is used to drive supermarket performance, Netflix: How Netflix used Big Data to Give us the programs we want, Rolls-Royce: How Big Data is used to drive success in manufacturing, and Facebook: How Facebook uses Big Data to make customer service more personal. Table 1 below list other multifaceted applications of Big Data as authored as individual chapters of Marr (2016) of how forty-five successful companies used Big Data to deliver extraordinary results.

Characteristics of Big Data

The Big Data concept is formed due to the rapid development of computer technology. There is tremendous amount of data being generated and analyzed every day. The concept describes how this large amount data has been utilized to benefit the society. It is not just large amount data, instead, it is an ad-hoc definition of how the data is being collected, processed and distributed. There are some commonly accepted characteristics of Big Data, such as volume, velocity and variety. (Russom, 2011).

Table 1. Successful applications of Big Data analytics by organizations and companies around the world

Organization/Company	Big Data Application
Amazon	How predictive analysis is used to get a 360-view of customers
Caesar's	Big Data at the Casino
Dickey's Barbecue Pit	How Big Data is used to gain performance insights into one of America's most successful restaurant chains
Experian	Using Big Data to make lending decisions and to crack down on identify fraud.
Fitbit	Big Data in the fitness arena
John Deere	How Big Data can be applied on farms
LinkedIn	How Big Data is used to fuel social media success
Ralph Lauren	Big Data in the fashion industry
Tera Seismic	Using Big Data to predict earthquakes
Transport for London	How Big Data is used to improve and manage public transportation in London, UK.
Twitter	How Twitter is used and IBM deliver customer insights from Big Data
Uber	How Big Data is at the center of Uber's Transportation Business
US Olympic Women's Cycling Team	How Big Data Analytics is used to optimize athletes performance
Walt Disney Parks and Resorts	How Big Data is Transforming our Family Holidays
ZSL and London Zoo	Big Data in the zoo and to protect animals

[Derived from book by Marr (2016).]