Chapter 10
Review of Big Data Applications in Finance and Economics

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ABSTRACT

Massively parallel processors and modern data management architectures have led to more efficient operations and a better decision making for companies to process and analyse such complex and large-scale data. Especially, financial services companies leverage big data to transform their business processes and they focus on understanding the concepts of big data and related technologies. In this chapter, the authors focus on the scope of big data in finance and economics. They discuss the need for big data towards the digitalisation of services, utilisation of social media and new channels to reach customers, demand for personalised services and continuous flow of vast amount of data in the sector. They investigate the role of big data in transformation of financial and economic environment by reviewing previous studies on stock market reading and monitoring (real-time algorithmic trading, high-frequency trading), fraud detection, and risk analysis. They conclude that despite the rapid development in the evolution of techniques, both the performance of techniques and area of implementation are still open to improvement. Therefore, this review aims to encourage readers to enlarge their vision on data mining applications.

INTRODUCTION

The world has been experiencing the revolution in information and communication technologies (ICTs) in last couple of decades. Big data appeared as a revolutionary phenomenon that influenced decision-making processes. In the 1960s and 1970s, companies' first attempts in data discovery for business purposes proceeded through various stages, shaped by heuristic decision making, simple reporting and

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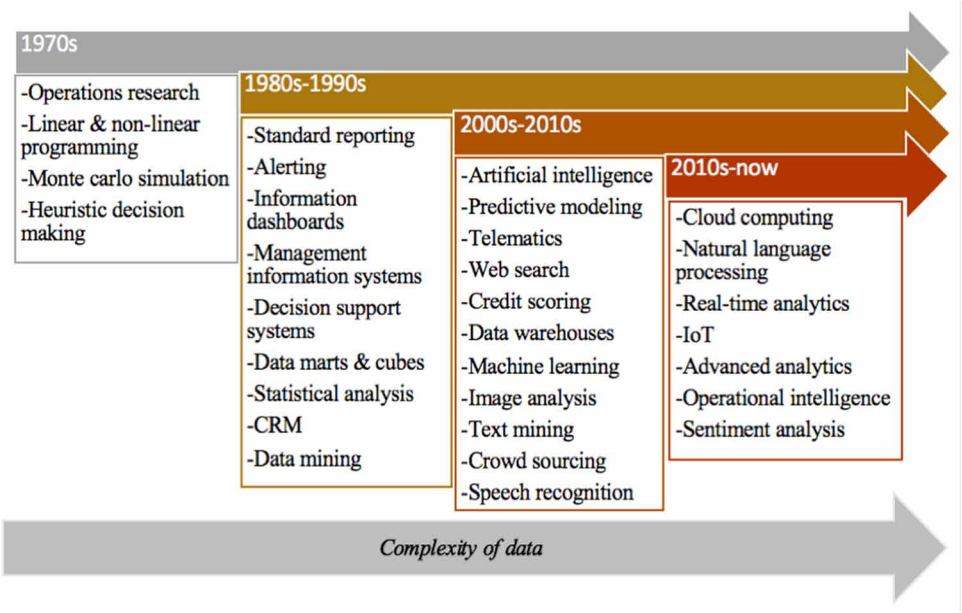
statistical analysis (Figure 1). In the 1990s, most companies organized data collections in table based format with rows and columns and they used relational or hierarchical databases to store their data. For cross-functional activities, fast query processing and multiuser environment, they implemented extract, transform and load (ETL) processes that help enterprise data mitigate from day-to-day transactions to data warehouses. The volume of data was measured in gigabytes at the very most.

Figure 1. Evolution of big data



In the early 2000s, companies started to focus on value creation by operational data warehouses that accumulate business transactions. The following decade brought out different kinds of data sources that were actively used as content management repositories and networked storage systems to manage enterprise information, and the size of databases began to increase in volume and scale. Terabyte-scale bases were replaced by petabytes. Traditional form of data types were augmented by unstructered data that either typically have text-heavy format without a data model. To realize business benefits from being able to process high volume of data, companies put emphasis on the speed of new data creation. High velocity data underscored to process large amounts of data at high rates of speed, resulting companies became more analytical and data-driven.

In 2010s, the advent of wireless communication (i.e., WiFi, cellular, GPS, bluetooth, RFID) over a wide area made the connection of devices possible with each other nearly anywhere. This resulted in hundreds of petabytes moving across networks per day. Companies has broadened their data management strategies with considering many kinds of data such as multimedia files, e-mail messages, webpages and other kinds of business documents. As a result of this, data has become a proprietary resource because of its value.

The second half of the 2010s strove to bring a next frontier for innovation in big data. The interconnection of sensing and actuating devices enabled distributed file systems among the connected users,