

Chapter 52

Affordances of Data Science in Agriculture, Manufacturing, and Education

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ABSTRACT

Continued technological advancements of the 21st Century afford massive data generation in sectors of our economy to include the domains of agriculture, manufacturing, and education. However, harnessing such large-scale data, using modern technologies for effective decision-making appears to be an evolving science that requires knowledge of Big Data management and analytics. Big data in agriculture, manufacturing, and education are varied such as voluminous text, images, and graphs. Applying Big data science techniques (e.g., functional algorithms) for extracting intelligence data affords decision markers quick response to productivity, market resilience, and student enrollment challenges in today's unpredictable markets. This chapter serves to employ data science for potential solutions to Big Data applications in the sectors of agriculture, manufacturing and education to a lesser extent, using modern technological tools such as Hadoop, Hive, Sqoop, and MongoDB.

INTRODUCTION

Data science as a new field of endeavor is increasingly in top demand (American Statistical Association, 2016) as technological advancements afford the availability of an abundance of real-time information (e.g., via social media or global positioning system) to users. Organisations and institutions face operational challenges such as fierce price wars, stronger competition, overhead controls, waste reduction, operational excellence, stressed customer demands, and reduced buying power. Such challenges may prompt “panic” decision-making in the absence of data science wherewithal by institutions/organisations in key sectors like manufacturing, agriculture, and education. Moreover, the education sector, unlike

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other service sectors, is not always prompt in responding to changing needs of the education market. Responsively, businesses and institutions can now tap into data they never knew earlier existed, making customized dynamic decisions with intelligence of no perceived boundaries. Data science as an information work space for data analytics affords in-depth processes such as scoring, predicting cross-field inputs, and functional algorithms, resulting in data warehousing and intelligence tools used appropriately for decision-making. Artificial intelligence plays a critical role in data analytics for decision making as it allows the computer system to almost think and find, while correlating varied pieces of information, producing meaningful results for analysts such as those in the agricultural sector (Roy, 2013, May 22; Tapia & Corchado, 2010). The challenge in this process is the evolution of data cognitively engaged and skimmed for decisions. The dawning of the field of data science enables market testing for possible products and services that are the real frameworks for revenue. Employing data science techniques in creating and analysing Big Data for supporting critical decision-making can enhance an institution/organisation's ability to satisfy customers' changing needs and build market resilience in key sectors such as agriculture, manufacturing, and education. To this end, this chapter specifically aims to achieve the following objectives:

- Explain the need for data science wherewithal.
- Analyze the use of data science in agriculture.
- Describe the use of analytical tools in data science.
- Analyze the use of data science in manufacturing.
- Describe uses of data science in education.

BACKGROUND

Survival in today's competitive global economy requires institutions and organisations to continually strategize for accessing and allocating their budgets, conducting customer research, and revisiting set targets in keeping with current market trends in sectors like agriculture, manufacturing, and education sectors. The success of such strategic decision-making is largely dependent on ready access to high quality operational and market intelligence data. One mechanism that can contribute to this success is the use of data science. As a new burgeoning field with attractive and stable employment potential, data science is described as "... an interdisciplinary field about processes and systems to extract knowledge or insights from data in various forms, either structured or unstructured, ..." (Stansbury, 2016, 1. Data Science/Data Administration section). Big Data is also defined as a collaborative phenomenon for guiding real-time insights into organisational and institutional operations through mathematical, statistical, computational, and data management skills (Magoulas & Lorica, February, 2009; National Science Foundation, 2012). Institutions and organisations can extract new sources of information that were previously unexplored through the application of data science. For example, the use of an evolving algorithm from voluminous data for such tasks as deciding priorities or choices, deep-cutting conventional approaches and the supplemental combination of observations, patterns, trends, sequences, similarities and data behavior are now possible for arriving at a superior solution. Data science is a composite clustering of machine learning, Big Data processing, and statistical routing along with expert convolutions for arriving at a best optimal range of solutions that can be customized by the user for effective results. Scenarios,

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