BIG DATA: A REVOLUTION THAT WILL CHANGE THE EDUCATION LANDSCAPE

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Abstract

The recent advance in Information and Communication Technologies has resulted in a considerable increase in the amount of information that is being generated. This data revolution commonly known as ‘Big Data’ is, actually, one of the highest IT trends that is made use of in various domains and for a variety of purposes. This data revolution will not only have an effect on how individuals and organizations process and use information, but will also drive revolutionary changes in many fields. However, one of main the fields on which big data can have a great impact is education. The objective of this paper is, therefore, to explore the potential influence that this voluminous amount of data can have on the education landscape. In this respect, it was found out that big data can provide valuable real-time insights on how students acquire and digest knowledge. Moreover, it can be used to provide every individual student with a more customized, effective and engaging learning experience. Finally, it enables students, teachers and decisions makers to receive immediate feedback needed to enhance the learning/teaching process.

Keywords: Big Data, education, impact, advantages.

1 INTRODUCTION

Thanks to the advent and proliferation of social media platforms, huge amounts of information are generated and shared across a variety channels. This generation of unprecedented volumes of data, which is increasing at a rate that is previously unimaginable, has brought about a concept, commonly known as ‘Big Data’ (Bakillah et al. 2014). This term refers to enormous data sets that are so dynamic and complex that they go beyond the processing capacity of traditional database systems and beyond the retrieving, storing, managing and processing capability of software tools (Dumbill 2013, Manyika et al. 2011). Oftentimes, big data also refers to technologies that are used to process these voluminous quantities of data (Davenport et al. 2012).

Big Data is currently one of the major Information Technology trends that can be beneficially made use of in various domains and for a variety of purposes. This concept will not only impact how people, institutions and businesses extract and process data but is also expected to play a major role in altering how things and activities are carried out. Big data, thus, represents valuable information that can open new avenues of opportunities in many domains. Yet, one of the major domains in which big data has great potential is education.

The objective in this paper is, therefore, to explore how big data will revolutionize the way in which education is delivered. The remainder of the paper is structured as follows. Section Two presents the key components of big data. Section Three examines the opportunities of using big data in the education sector. Finally, Section Four gives a brief conclusion.

2 BIG DATA: KEY COMPONENTS

Big Data is generally understood as the convergence of five dimensions which are termed the V’s of big data. These include volume, variety, velocity, veracity and value. The five V’s are briefly presented below.

2.1 Volume

Volume, the major characteristic that makes data “big”, refers to the huge amounts of data that are generated. In the past, the quantity of information that was produced was minimal. Recently, thanks to the advances in information and communication technologies, the total amount of information has grown exponentially. Following a research study carried out by IBM in 2011, it was noted that 2.5 quintillion bytes of data are produced everyday (Coyne et al. 2014). On the Web, the huge amounts of
data are generated mainly on social media platforms. On Facebook, for instance, more than 4 new petabytes of data are produced per day. Likewise, Twitter generates more than 400 million tweets a day (Ballard et al. 2014) while more than 100 hours of video content are uploaded on YouTube every minute. In addition to the data produced on the Web, large quantities of data are also generated every second by sensors that are installed on millions of devices around the world. Big data is, therefore, generated by everything around us and at all times.

2.2 Variety
Variety refers to the increasing diversity of data types and to the multiple sources that create and capture this data. In addition to structured data types that can be neatly displayed in titled columns and rows, and easily ordered in tables or relational databases, huge amounts of unstructured data are also generated. These data types, which represent 80% of the world’s data are derived from a multitude of sources, namely emails, video and audio files, social media updates, photos, web pages, web logs and sensor feeds. The objective of big data technologies is, therefore, to make beneficial use of all these various datasets, whether they be structured, semi-structured or unstructured.

2.3 Velocity
Velocity denotes the speed at which data is produced and processed (Gandomi & Haider 2015). The rapid advances in information and communication technology, especially the emergence and propagation of smart devices has resulted in an exponential growth in the creation of huge amounts of data. Today, data is not only produced in large quantities but also at a pace that is impossible for traditional systems to retrieve, store and analyze. The challenge is not just that lots of data are produced, but they are generated at high velocity. Consequently, systems that are capable of processing data in real time or near-real-time are needed for alerts and operational efficiency.

2.4 Veracity
Veracity refers to the credibility associated with data. In other words, is the data that is generated and processed reliable and trustworthy? Will this data be useful for the problem that is being analyzed? (Faizi et al. 2017). With the large amount of data that is surging, the trustworthiness of the data definitely takes a toll. Though often ignored, veracity is as essential as the other components of big data. In fact, with the massive amounts of data that is being generated in various formats and from different sources, the consistency and accuracy of this data has become more important than ever before (Hall, 2013). Since much of the data deluge comes from anonymous and unverified sources, it is necessary to manage the quality of the data when formulating a big data strategy so as to avoid making decisions based on uncertain or imprecise data.

2.5 Value
Value, the most V of big data, refers to the worth of collecting and analyzing data. In other words, it refers to the purpose behind extracting and processing that data. Big data can, for instance, provide organizations with new opportunities for learning, creativity and innovation (Fan & Bifet 2013). It can also allow businesses to better understand and serve their customers, enable companies to optimize their processes, help enhance the educational system and also improve health care. It is, therefore, essential that anyone aspiring to make use of big data, be they individuals, businesses or organizations, have made sure that the data they are extracting can be turned into value as quickly and as cost-effectively as possible. Otherwise, it is no use collecting that data. Without a clear understanding of the value big data will bring, they will drown in data while thirsting for the benefits.

3 BIG DATA: EDUCATIONAL OPPORTUNITIES
One major promise of using big data in education is that it can provide students with customized learning experiences (Siemens & Long 2011, Dietz-Uhler & Hurn 2013). In fact, based on data that is collected at every step of the student learning process, every individual student can be offered a customized learning experience that meets his distinctive learning needs, interests, aspirations, and cultural backgrounds. Rather than resorting to the so-called “one-size-fits-all” learning approach in which the instructor treats all students in the same way by teaching the entire class the same predetermined concepts using the same methodology, academic institutions can, thanks to big data,
address the student’s needs with personalized lessons, assignments and feedback that will foster a better and richer learning experience.

Another potential benefit of using big data in education is that it can help decrease the student dropout rate (Tang et al. 2015). In many schools and colleges, advisers do not generally see students except when they need to register, when they seek out help or when they are about to flunk out. However, thanks to the massive amounts of data that are collected about students, namely, attendance history, test scores, class performance, disciplinary actions and socioeconomic status, school administrators can pinpoint students who are in crisis and intervene before they drop out. Therefore, low grades and poor attendance are no longer seen as the only indicators for the identification of dropouts. In fact, based on the large amounts of students’ academic and demographic data, analysts can systematically single out students who are on the verge of dropping out and prompt staff to take the necessary measures before it is too late (Niemi & Gitin 2012).

Big data can also monitor student’s progress in real-time (Picciano 2012). Thanks to the data that students leave behind while learning, it is possible to monitor how students interact not only with colleagues and teachers but with the online learning materials as well. Teachers can, for instance, identify which course or which parts of a course are difficult to understand, how many questions are asked around a given topic, how much time students take to answer a question, which other learning resources they use and how much research they do? Based on this information, it is possible to identify the strengths and weaknesses of each individual student and which tips work best for which student. As teachers receive this pertinent information about students’ learning modes, they will be able to provide every student with instant and appropriate feedback. These interactions will not only allow students to get more engaged in the learning process but will also help improve their overall results (Faizi et al. 2015). The valuable data that students generate will also allow educators to improve the learning materials and educational strategies.

In addition to the above mentioned opportunities, big data technologies can predict students’ success or failure. In fact, based on current and past students’ data, academic institutions can foresee within the first weeks of a given course whether a student will successfully complete that course or not. Big data systems can go further by predicting what grade that student or any other students sharing the same data characteristics would get in each class. Based on these predictions, these students can, therefore, be recommended courses or majors in which they are likely to do well in. Big data can even predict which students are likely to get a degree, and which will become active graduates.

For their parts, colleges and universities can, through big data and predictive analytics, make data-driven decisions (Basu 2013). In fact, in addition to enhancing students’ academic performance and instructor effectiveness, big data can be made use of to make smart student enrolment decisions. Big data can also help academic institutions find out about current as well as future skills that are needed by the job market on a global scale. As such, they will be able to tailor their curricula to meet industry demands.

4 CONCLUSION

The objective of this paper was to explore the ways in which big data will revolutionize education. In this context, it was found out that this data revolution has the potential to greatly impact how education is delivered. In fact, it was demonstrated that this huge amount of valuable information can provide students with personalized learning experiences, reduce dropout rate, and monitor students’ progress in real-time. Moreover, big data can predict students’ success or failure and can enable academic institutions to make effective data-driven decisions.

REFERENCES


