



BIG DATA ANALYTICS IN EMERGING EDUCATION

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Abstract

Big data is characterized from the context of volume, velocity and veracity and encompasses different challenges including analysis of data, capture and data curation, efficient storage, transfer and visualization of data along with the privacy and security of data. The analytics defines the process of examining data sets containing a variety of data types to uncover hidden patterns and enable meaningful interpretation for representations and thereafter the applications. This paper will describe the big data analytics in education and considers the data science and the summaries significance of Big Data and Learning Analytics in education. The paper also intends to focus on research and development issues for educationist and practitioners of big data analytics.

Keywords— *Big data, IoT, Analytics, Learning Objectives, Teaching Methods, Learning analytics, Learning Outcomes.*

INTRODUCTION

Big Data is having an influence everywhere and education is not an exemption. Big data is becoming a fruitful tool in the education system. In the last decade, learning has changed its phase from a passive to an active experience. The traditional education system requires classrooms, textbooks, reference books, teachers, and all institutional management which are now drastically

changing. Institutions are no longer required to continue education in a conventional way. From homeschooling programs that have become highly effective to the online colleges, to the efficient online educational tools to boost professional career, the opportunities to expand intelligence of learner from their desk are abundant.

Institutions of higher education are operating in an increasingly complex and competitive environment. They are under increasing pressure to respond to national and global economic, political and social change such as the growing need to increase the proportion of students in certain disciplines, embedding workplace graduate attributes and ensuring that the quality of learning programmes are both nationally and globally relevant.

Big Data is assisting educational institutions and companies to understand things they could not have previously. For student enrollments, Big Data and predictive analytics have the ability to prepare analytical databases which can cater to college administrators with fast, actionable information. This information helps them to take smart enrollment decisions and allocate both staff time and financial resources to raise enrollment from current markets while constructing new ones. Companies like edX are



using Big Data to determine what kinds of classes can be conducted online and which are best suited to a classroom culture.

From a student's viewpoint, Big Data and predictive analytics can assist the candidate to shortlist colleges that best fit their profile. These conclusions based on thousands of data points that can guide the applicants towards those colleges and universities which will be the best match to their profile. College students are increasingly using social media to guide and influence their college choice. [3] discussed about a system, the effective incentive scheme is proposed to stimulate the forwarding cooperation of nodes in VANETs. In a coalitional game model, every relevant node cooperates in forwarding messages as required by the routing protocol. This scheme is extended with constrained storage space. A lightweight approach is also proposed to stimulate the cooperation.

Reshaping Learning Through Big Data

While considering modern-day educational learning, there's no doubt that students are having more options than ever before. They can learn at their convenience from home, the coffee shop, or the classroom with the assistance of Big Data as a tool which is more powerful than conventional learning.

Digitized Textbooks

Future Textbooks will be not likely to anyone who carried around heavy backpacks in their high schools and colleges. The transformation from a backpack that's full of books to a slim smartphone has been an ongoing phenomenon

for some time, but the future textbooks will be increasingly interactive, collaborative, and updated for accuracy in real-time.

“There is a plenty of information available on students' habits of reading and the amount of time they spend for studying. With online textbooks, publishers and professors now have access to information that shows exactly how, when, how often and why the students use textbooks.”

This data assists publisher with insights that inform the editorial process and also gives teachers access to information that can help them to improve as the instructions based on student's learning habits. With the digital textbook, updates can be automated in real time whenever required, homework sections in the book also can be graded in real time, video files and audio files can be installed, and much more.

Internet of Things (IoT)

The IoT market is continuously expanding, from consumer electronics, manufacturing, e-commerce, autonomous vehicles, drones, and education. IoT integration is much beneficial for higher education because its cloud capabilities reduce hardware costs. Most of the students have Internet-connected devices which create an academic infrastructure that is no longer restricted by traditional barriers, such as geographical location, language, specialized learning needs. It makes the campus without a physical library. All books can be digitized and readily available for every student at the same time, independent of the number of copies of physical books unlike before.



Plenty of data and analytics tools available to give an opportunity to create a high level of personalization. Every single learner isn't the same, thus teachers can become much more effective when equipped with the tools to evaluate the student's abilities and challenges. Most of the students get bored while studying in a textual format so now, textbooks are not only coming with just a digital copy, but also they have web-based sites that include animations, videos, and sample quizzes. Digital textbooks have benefited with an active feedback loop in which students and teachers can note areas of confusion also they can highlight the tools that are helpful. Changes and improvements made in real time can actually be profitable for the students and teachers immediately, instead of semesters or years later unlike before.

Big Data for e-learning: From Classroom to Corporate World

Now e-learning is not only limited to classrooms for studies, but it also benefits to the corporate world for the improvement of employee skills within least time span. Also, the e-learning is becoming more useful for physically handicapped and ill students who can't attend classes, it helps them to overcome the losses they suffer due to unavailability in the classrooms. The conventional classrooms are also becoming e-classrooms which provide e-learning, helps students to easily grasp knowledge as it is available in pictorial forms. Big Data is fruitful in e-learning as learning material is analyzed based on usefulness and acceptability to make it readily available for all at the same time.

Generally, the goal of any invention is to make the life of a human being easy and comfortable. The Big Data also altered the way of learning by making it easy, simple and interesting. The traditional classroom environment is no longer necessary for learning. Technology will continuously make learning easy for the convenience of students, no matter someone likes it or not.

BIG DATA ANALYTICS

The process of analyzing and mining Big Data – can produce operational and business knowledge at an unprecedented scale and specificity. The need to analyze and leverage trend data collected by businesses is one of the main drivers for Big Data analysis tools.

BIG DATA FRAME WORK FOR EDUCATION SYSTEM

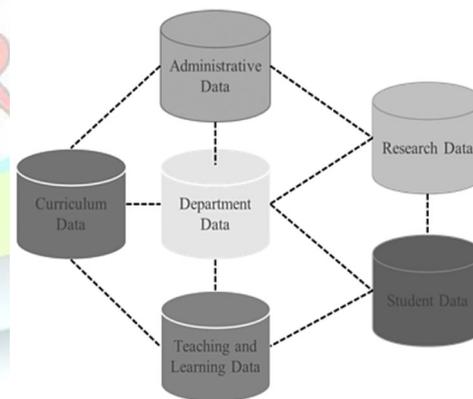


Fig-1 Big Data framework of Education System

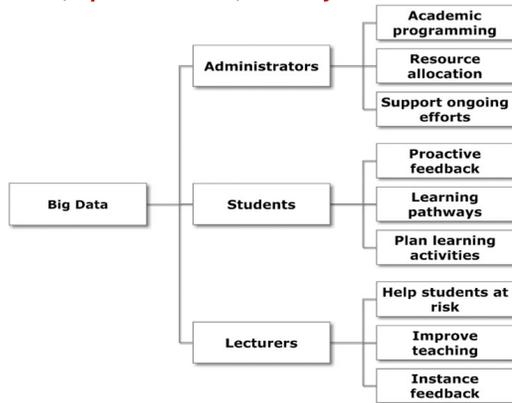


Fig-2 Big Data analysis of Education System

between an individual TM and its LOs depict the extent in which each TM's content is used to address the specific LO. A number of non-addressed LOs are depicted on the top-right corner to complete the set of predefined LOs (16 in total) that the medical programme should address within the different courses. Here, the LOs and TMs are mapped and represented hierarchically from its 100% of TMs to corresponding percentages of TMs showing to which extent each TM is used in the course.

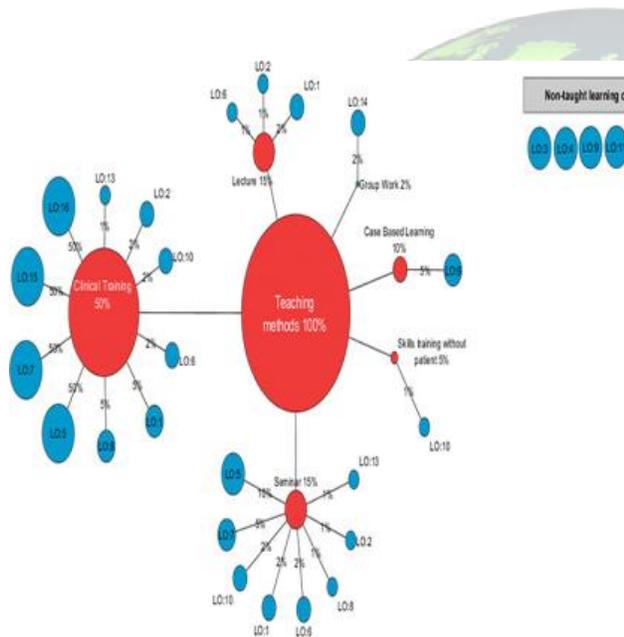


Fig-3 Learning Methods and Teaching

In Fig-3, we see how the learning outcomes (LO) and the teaching methods (TM) of one course were modelled to visually represent the hidden underlying network of connections and relations between them. The TMs are depicted in percentages in red, to show to what extent each TM is used in the course out of a 100%. Each TM addresses a number of LOs, and these are depicted in light blue. The percentages

In Fig- 4, we see how the LOs of the same course were modelled this time against the assessment part and more specifically one part of the assessment, the questions used in the written examination, 34 in total. The percentages on the connections between yellow and red circles depict the proportion (out of 100%) of exam questions used to address the specific LO in red.

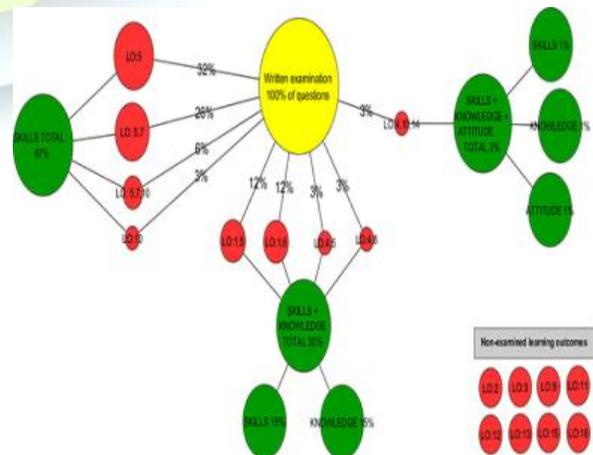


Fig-4 Examination and Learning Outcomes

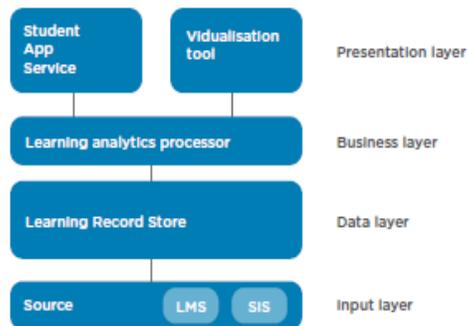


ARCHITECTURE OF LEARNING

ANALYTICS

"Learning Analytics is the use of intelligent data, learner-produced data, and analysis models to discover information and social connections for predicting and advising people's learning." *George Siemens*

LA Architecture - layers



QUALITY IMPROVEMENT OF EDUCATIONAL PROCESS

VA could be used to support the analytical reasoning and decision making of stakeholders involved in the quality improvement of the educational process. This is achieved when both visual and analytics factors function as instruments of a harmonized engine that complement and support each other. The analytics factor applied on the big educational data aims at reducing its complexity without losing vital information and critical characteristics; these are kept at the top level of the presented visuals. The other factor is the visualization, which brought pathways and relations into light by taking advantage of the

human ability to process and understand visual information more easily.

CONCLUSION

The availability of Big Data, low-cost commodity hardware, and new information management and analytic software have produced a unique moment in the history of data analysis. The convergence of these trends means that we have the capabilities required to analyze astonishing data sets quickly and cost-effectively for the first time in history. They represent a genuine leap forward and a clear opportunity to realize enormous gains in terms of efficiency, productivity, revenue, and profitability. We conclude the concept of big educational data and the different forms of analytics as applied scientific areas and go deeper to popular techniques for data manipulation and how they can be transferred within the education system and used as approaches to exploit big educational data that such systems produce. Apart from the techniques itself, the benefits and potential to use them for quality improvement purposes in education are provided and also the need of data visualization techniques to be improved.

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