



SUSTAINABLE DEVELOPMENT IN EDUCATION THROUGH EDUCATIONAL INTELLIGENCE & BIG DATA ANALYTICS

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ABSTRACT

Artificial Intelligence (AI) is a growing domain impacting every aspect of our life and has proven its role as a game changing factor in number of fields, causing transformations unimaginable in the past. In education too, AI has begun producing new teaching and learning solutions that are now in the nascent stage. In the past years, computer hardware, software and online service have managed to bring changes and reforms to classrooms and teaching methods. But the true disruption of education is yet to come using Artificial Intelligence (AI). Artificial Intelligence is no longer a graphic scene in science fiction films but is going to be part of our everyday lives and in our classrooms too. As we use tools like Siri and Amazon's Alexa, we have started to realise the possibilities of AI in education. This paper is aimed to discuss the role of artificial intelligence in education sector including its market size, impact of AI in education, recent applications and impact of Big Data technologies in education.

Keywords: Artificial Intelligence, Big data, Education, classrooms

I. INTRODUCTION

Artificial Intelligence (AI), expert systems are designed to interact with the world through capabilities like visual perception, speech recognition and intelligent behaviour that we would think of as essentially human. Knowingly or unknowingly, we are using some AI applications tools commonly in our daily life like communication, travel, social networking, online shopping, education etc. In this context it is noteworthy to mention that AI application in education is growing remarkably. Teachers and students have a wide range of tools available, ranging from Google Search engine, in which alternate search terms are instantly suggested, citation generators, plagiarism checkers, and even 'Siri' has become a popular tool for searches. An astounding amount of information generated instantly, far more advanced from thirty years ago and society's reliance on card catalogues, calculators and books.

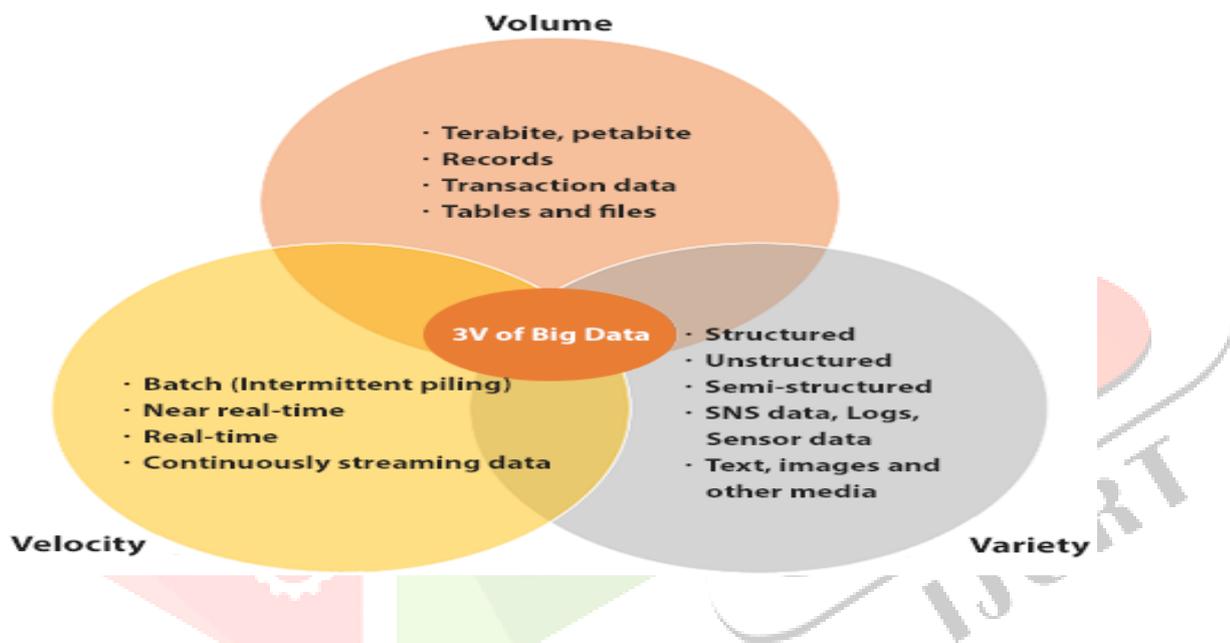
The increasing adoption of the AI technology for various applications in the education sector and growing need for multilingual translators integrated with the AI technology are expected to drive the growth of the AI in education market. Students have started using smart phones to access learning content. As the learning environments have become accessible anywhere through the internet, students access their courses anywhere and indulge in learning activities. Students' activities through learning management systems create large amount of data that can be utilized in developing the learning environment, helping the students

in learning and improving the overall learning experience. In addition to the data available from student activities, data are also created by educational institutions which use applications to manage courses, classes and students. The amount of data made available in the above scenarios is so enormous and the traditional processing techniques cannot be used to process them. Due to the limitations of the conventional data processing applications, the educational institutions have started exploring “Big Data” technologies to process the educational data.

II. BIG DATA

The term “Big Data” refers to any set of data [3] that is so large or so complex that conventional applications are not adequate to process them. The term also refers to the tools and technologies used to handle “Big Data”. Examples of Big Data include the amount of data shared in the internet every day, YouTube videos viewed, twitter feeds and mobile phone location data. In the recent years, data produced by learning environments have also started to get big enough raising the need for Big Data technologies and tools to handle them

A.CHARACTERISTICS OF BIG DATA



- *Volume*

Data is being generated in terms of hundreds of terabytes, petabytes or zettabyte. The volume of the data is the data generated or available to education 8. The capacity of data in LMS or called as the records become bigger. The issue is focused on capacity for data processing and also the system ability to process it.

- *Velocity*

The rate of creation of data is termed as velocity of data. It is seen that data is being generated at exponential rate. The digital being generated is enormous and is overwhelming 9. It is relating to the characteristic of volume, bigger more time needed to process it. The speed is increasing when the new data generated and moves.

- *Variety*

This is a measure of varied data representations like text, audio, video, images. These varied data are structured, semi structured and unstructured forms of data. Apart from the above mentioned about three dimensions. There have been other dimensions like value and variability being considered by different data scientists 10. These are dealing with the characteristic of volume, velocity and variety for the accuracy and potential value of Big Data.

- *Variability*

Data apart from being varied, voluminous is also highly inconsistent in flow. Data flow can be event triggered, seasonal among other reasons. These variable data loads are challenging. Unstructured and variable load of data makes the task of analyzing more complex 11.

- *Value*

This” fifth V “is the key element which understands the behavior or pattern generated by the data. This paves way for a predictive model generation 12.

B. BIG DATA IN EDUCATION

Big Data Analytics is the state-of-the-art technology to make big data enabled decision-making feasible and affordable for organizations and businesses. Application of big data in businesses and education system are quite common because the well-established principles of business computing and models used for business intelligence can be adapted to fit into the educational framework. This is exactly the reason why the term ‘Academic Intelligence’ can be best used to describe techniques, analysis tools used for gaining insights into academic information and reporting applications at large. Higher education is under huge pressure to increase admissions, reduce the student dropout, improve student’s grades, ensure students graduate, reduce costs, enhance the learning experience and improve learning quality (Kumar, B. and Pal, S. (2011); Sousa JD, T., Adams, P., 2015). These pressures are pushing universities and colleges to develop and re-think the way things will be done and to drive towards new answers to solve these difficulties. Many universities are employing data evaluation and visualization to understand the problem and develop effective solutions (Siemens, G., Dawson, S. and Lynch, G. (2013); Barber R and Sharkey M, (2012).

C. APPLICATION of BIG DATA IN EDUCATION

Big Data techniques can be used in a variety of ways in learning analytics as listed below :

- Performance Prediction

Student's performance can be predicted by analysing student's interaction in a learning environment with other students and teachers

- Attrition Risk Detection

o by analysing the student's behaviour, risk of students dropping out from courses can be detected and measures can be implemented in the beginning of the course to retain students.

- Data Visualization

o Reports on educational data become more and more complex as educational data grow in size. Data can be visualized using data visualization techniques to easily identify the trends and relations in the data just by looking on the visual reports.

- Intelligent feedback

o Learning systems can provide intelligent and immediate feedback to students in response to their inputs which will improve student interaction and performance.

- Course Recommendation

o New courses can be recommended to students based on the interests of the students identified by analysing their activities. That will ensure that students are not misguided in choosing fields in which they may not have interest.

- Student skill estimation

o Estimation of the skills acquired by the student

Behaviour Detection

o Detection of student behaviours in community-based activities or games which help in developing a student model

- Grouping & collaboration of students
- Social network analysis
- Developing concept maps
- Constructing courseware
- Planning and scheduling

III. CHALLENGES

Recent systematic reviews show that AI in Education has been a field of research concentrated in developed countries (Roll & Wylie, 2016). As part of an advance technological discussion that builds upon firmly developed infrastructure and knowledge ecosystems, AI in Education is a neglected topic in the developing world. This document intends to bring the discussion to the least developed and developing countries, recognising the multiple limitations these countries face while uncovering the need for structural innovation to leapfrog education as a human right using technological opportunities to advance at a large scale in new learning scenarios.

This final section presents the six main future challenges regarding the incorporation of AI in education as a way to improve the equity and quality of learning and to promote the realisation of SDG 4. It combines the two main topics of this document, namely the new opportunities of AI to improve learning and the way education should prepare students and future workers in an AI-powered world.

A. First Challenge: A Comprehensive Public Policy on AI For Sustainable Development

The education sector is both customer and actor in the face of sweeping developments in AI-powered technology. In this regard, the education component becomes key when countries develop national AI strategies, as we've seen in the cases of Australia, China, Estonia, France, Singapore, south Korea and, albeit more recently, the United States.

B. Second Challenge: Ensuring Inclusion and Equity In AI In Education

While AI can open numerous possibilities as presented in this paper, it can also be a disruptive technology and may deepen the existing inequalities and divides as the marginalised and disadvantaged population are more likely to be excluded from AI-powered education. The result is a new kind of digital divide: a divide in the use of data-based knowledge to inform intelligent decision-making (Hilbert, 2015).

C. Third Challenge: Preparing Teachers for AI-Powered Education And Preparing AI To Understand Education

There are no indications of a system-wide adoption of AI-based applications for teaching and learning or system management, even though the educational technology industry has yet to cease production on new developments. Their fundamental flaw is that, rather than addressing the existing problems and issues that teachers face, they promote new ways of organising teaching that collide with mainstream traditional practices, often without rigorous evaluations supporting the claimed benefits of new solutions

D. Fourth Challenge: Making Research on AI

In education significant While we can reasonably expect increased research on AI in education in the coming years, it is also worth recalling the difficulties that the education sector has in taking stock of educational research in a significant way for practice and policy-making. The particular domain of research on educational technology clearly demonstrates that what

E. Fifth Challenge: Ethics and Transparency In Data Collection, Use And Dissemination

The ethical quandaries that come with the large-scale collection, production, analysis and dissemination of data about persons are another important consideration in the development of any concerted policy framework for AI. It must be noted, though, that seeking to understand the ethical implications of new technologies is by no means a new pursuit.

IV. CONCLUSION

Till date, non-State actors, particularly the private sector, have principally led the response to AI in most countries. Tech giants, concentrated largely in the United States and China, for instance, are dominating the development of AI-enabled technologies. The rise of tech start-ups has also played a significant role in accelerating AI penetration. The rapid expansion of the EdTech industry is particularly notable, with AI-enabled learning technologies seeing increasing use in the classroom. Nonetheless, given the increasing ubiquity of AI in all aspects of human activity, more and more governments are beginning to actively implement concrete responses to AI. Some countries such as France, Australia, Estonia, South Korea, China and the United States have even released national AI strategies. In all such responses, education is a comprehensive element. However, in developing countries, these discussions are far off and limited by structural obstacles (basic technological infrastructure, high profile trained human resources in the field of AI, etc.). What are the possible paths to unfurling comprehensive strategies in developing countries to integrate AI in education? What is the international community's role in helping bridge the digital gap between countries that is increasing their social divide? This paper discussed these questions using examples and reflections on two main axes through which the education sector can leverage and adapt to AI: (1) using AI to generate real-time insights towards improving educational outcomes; and (2)

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