

# Big Data Analytics in Higher Education

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**Abstract** - This paper is about the use of Big Data Analytics In Higher Education. In this paper, we see what the big data is and where does it come from. Then we see what the big educational data is, how it is generated and analyzed. We also describe the seven Vs of big data and some other factors are responsible for some issues and challenges to the use of analytics in this sector. We will discuss those issues and challenges and discuss some proposed solutions to address them. Institution of higher education are operating in an increasingly complex and competitive environment. This paper identifies contemporary challenges facing institution of higher education worldwide and explores the potential of big data in addressing these challenges.

**Key words** - Big Data, Higher Education, Analytics.

## 1. INTRODUCTION

Higher education is one of the major necessities for the development and growth of the society and the nation. A college student is considered more skilled, both professionally and personally. A highly-educated person gets to enjoy higher incomes and improved social conditions. Today the education sector has become technology oriented to a considerable extent [1]. In many institutes, the students upload their assignments online through their moodle accounts instead of directly submitting to their faculty. Students also write their exams online. Teachers upload their prepared notes on some online portal and students download them from the sources. In several institutes, whiteboards have been replaced by smart boards. They also have digital libraries where issuing and returning of books is without any need of human interference.

Big data analytics can address some issues such as retention of students, improving their

progression, improving curriculum and teaching quality, graduation rates etc. Implementation of analytics can help the institutes to enhance their students success rate.

This process will help the higher education universities to empower their consumer or stakeholders. Analytics performed from the data collected from student information like-enrollment, academic, extracurricular, financial and instructional plays an important role in performing an analysis of students and learning data to make informed decision on future course offerings [1].

Higher and professional education is a domain which constantly needs to be the evaluated and transformed to follow the fast pace of changing trends in different sectors in the market which in turn creates a variety of needs in workforce. A major factor that has to be radically altered the way education is conducted is technology.

Examples of different types of technologies used in today's educations are mobile devices, remote access systems, teleconference, educational platforms and services and other that students, teachers, evaluation specialists, academic faculty, researchers and decision-makers in education interact with and use in an effort to impact and improve teaching and learning but also to realistically reflect in the learning stage the usage of modern technologies used in real settings [2].

## 2. WHAT IS BIG DATA?

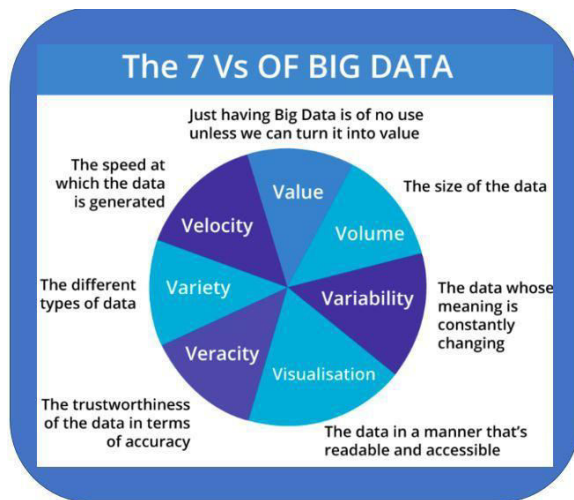
Big Data is data sets that are so complex and voluminous that traditional data processing application software are inadequate to deal with them. Big data challenges include data storage , data analysis search ,capturing data transfer,

sharing, visualization , querying , updating and information privacy.

Big Data is a phrase used to mean a massive volume of both structured and unstructured data that is so large it is difficult to process using traditional database and software techniques. In most enterprise scenarios the volume of data is too big or it moves too fast or it exceeds current processing capacity. Extremely large data sets that may be analysed computationally to reveal trends, patterns and associations, especially relating to human behavior and interactions.

Earlier the characteristics of the big data could be described using 3 Vs -Volume, Velocity and Variety. But, today these can be described more broadly using 7 Vs

1. Volume
2. Velocity
3. Variety
4. Value
5. Veracity
6. Visualization
7. Variability



**Figure 1. - The Seven V's of Big Data**

#### 1. Volume -

Volume is how much data we have. Previously, Volume has to be measured in Gigabytes and is now it has to be measured in Zettabytes (ZB) or even Yottabytes (YB). The IoT (Internet of Things) is creating exponential growth in data. This infographic from CSC does a great job showing how much the volume of data is projected to change in the coming years.

#### 2. Velocity -

Velocity is the speed in which data is accessible. I remember the days of nightly batches, now if it's not real-time it's usually not fast enough.

#### 3. Variety -

Variety describes the one of biggest challenges of big data. It can be unstructured and include so many different types of data from XML to video to SMS. Organizing the data in a meaningful way is no simple task, especially when the data itself changes rapidly.

#### 4. Variability -

Variability is different from variety. A coffee shop may offer 6 different blends of coffee, but if you get the same blend every day and it tastes different every day, that is variability. The same is true of data, if the meaning is constantly changing it can have a huge impact on your data homogenization.

#### 5. Veracity -

Veracity is all about making sure the data is accurate, which requires processes to keep the bad data from accumulating in your systems. The simplest example is contacts that enter your marketing automation system with false names and inaccurate contact information. How many times have you seen Mickey Mouse in your database? It's the classic "garbage in, garbage out" challenge.

#### 6. Visualization -

Visualization is critical in today's world. Using charts and graphs to visualize large amounts of complex data is much more effective in conveying meaning than spreadsheets and reports chock-full of numbers and formulas.

#### 7. Value -

Value is the end game. After addressing volume, velocity, variety, variability, veracity, and visualization which takes a lot of time, effort and resources you want to be sure your organization is getting value from the data.

### 3. ANALYTICS IN HIGHER EDUCATION

Per the definition given by the Educause, Analytics is an overarching concept that that is defined as data-driven decision-making [3].The data is gathered. It is then turned into information. Finally, this information is used to help learners for progress and betterment. Through analytics in higher education sector, we can see a complete view of everything. It allows both the institute, and its students, make some good data-driven decisions.

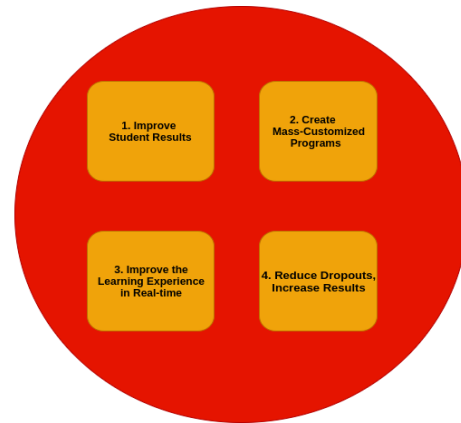
Analytics in Education sector is classified into the following 8 levels :

1. Personal Level - indicates the analysis of personal performance in terms of the goals and labels.
2. Course Level- is related to conceptual development.
3. Departmental Level- deals with predictive modelling, patterns of success/failure Institutional level deals with the performance of academics, resource allocation etc.
4. Regional Level- involves a comparison between systems and standards.
5. Nano Level- It relates to activities in a course.
6. Micro Level- It indicates an entire course in the education program.
7. Meso Level- It describes many courses in an academic year.
8. Macro Level- It describes several programs in the institution [4].

### 4. FOUR WAYS BIG DATA IS TRANSFORMING THE EDUCATION SECTOR

Big data in education sector is likely to offer numerous benefits to students and educational institutions.It will revolutionize the way we manage education, in significant ways.

Big data in the education sector offers unprecedented opportunities for educators to reach out and instruct student in new ways .It will give them a deeper understanding of student's education experience and thereby help them evaluate the state of education system. In this post, we have tried to summarize some of the key ways in which big data can impact the education system of any country [5].



**Figure 2. - Four Ways**

#### 1. Improve Student Results -

The overall goal of Big Data within the educational system is to be improve student results. Better students are good for organisations, society as well educational institutions. Currently, the answers to exams and assignments are the only measurements on the performance of students. During his or her students life, each and every students generates a unique data trail. This data trail can be analysed in real-time will help gain a better understanding of the individual behavior of students, and in creating an optimal learning environment for the students [5].

With big data in the education sector, It is possible to monitor every action of the students, such as how long they take to answer a question, which sources they use for exam preparation, which questions they skip, how much research was done, what the relation is to other questions answered, which tips work best for which student etc. In addition, Big Data in education sector can help to create groups of students that prosper due to the selection of who is in a group. Students often work in groups where the students are not complementary to each other.

#### 2. Create Mass-Customized Programs -

With the help of big data in education sector, customized programs for each individual student can be created. Big data allows for customization at colleges and universities, even if they have 10.000s of students. This will be created with 'blended learning' which is a combination of online and offline learning. It will gives students

the opportunity to follow classes that they are interested in, develop their own personalized program, and also work at their own pace, while still having the possibility for offline guidance by professors. Providing mass customization in education sector is a challenge, but thanks to algorithms it becomes possible to track and assess each individual student.

### 3. Improve the Learning Experience in Real-time -

When students start working on their own, in their customized blended learning program, the vast amount of teaching, which most of the time is covered by general topics that have to appeal to all students from different levels, can be done online and by themselves. The professor can monitor all students in real-time and start a much more interesting and deeper conversation on the topic of choice. This will give students the possibility to gain a better understanding of the topics.

When students are monitored in real-time, it can help to improve the digital textbooks and course outlines that are used by the students. Algorithms can monitor how the students read the texts. Which parts are difficult to understand, which parts are easy and which parts are unclear. Based on how often a text is read, how long it takes to read a text, how many questions are asked around that topic, how many links are clicked for more information etc. If this information is provided in real-time, authors can change their textbooks to meet the needs of the students thereby improving the overall results.

### 4. Reduce Dropouts, Increase Results -

All these analyses will improve the student results and perhaps also reduce dropout rates at universities or colleges. Dropouts are expensive for educational institutes as well as for society. When students are closely monitored, receive instant feedback and are coached based on their personal needs, it can help to reduce dropout rates as mentioned as well in a post by Hortonworks.

Using predictive analytics on all the data that is collected can give educational institute insights in future student outcomes. These predictions can be used to change a program if it predicts bad results on a particular program or even run scenario analysis on a program before it is started.

Universities and colleges will become more efficient in developing a program that will increase results thereby minimizing trial-and-error.

After graduation, students can still be monitored to see how they are doing in the job market. When this information is made public, it will help future students in their decision when choosing the right university.

Big data will revolutionize the learning industry in the coming years. More and more universities and colleges are already turning to Big Data to improve overall student results. Smarter students who study faster will have a positive effect on organisations and society. Therefore, let's not wait and let's embrace Big Data in education! [6].

## 5. NEEDS, CHALLENGES & OPPORTUNITIES



**Figure 3. - Needs, Challenges & Opportunities**

### Opportunities Provided by Big Data Analytics in Higher Education -

We know that the big data analytics provide many benefits. Hence, it offers several opportunities for innovation in the future.

1. **Personalization** - Big data analytics could help developers to develop personalized courses according to cope up and match with the learning ability of each student. It will ensure higher rates of classroom success and higher engagement of students.
2. **Motivation** - We have seen that how the

analytics could do wonders in improving students' performance. If students could realize its impact and if they themselves witness its benefits, they will become more interested in inputting data for the process and betterment.

3. Collaboration - Big data analytics can promote collaboration among various institute at regional, national and international levels. It will also help institutes make comparison among them [7].
4. Effectiveness in learning - Self-measurement by learners and teachers can improve learning. We can achieve higher student success rate and knowledge flow [7].

## 6. CONCLUSION

The higher education sector can be enriched with new teaching and learning methods. Big data can improve not only the quality of learning process, teaching process, services but also help in effective and sustainable management. It will also improving the student experience and reducing dropout rates will ultimately improve a universities reputation and ranking.

## REFERENCES

- [1] Saptarshi Ray. Big Data in Education. Research Gate, 2013.
- [2]<https://www.intechopen.com/books/big-data-on-real-world-applications/introduction-to-big-data-in-education-and-its-contribution-to-the-quality-improvement-processes>
- [3] Angela van Barneveld, Kimberly E. Arnold, and John P. Campbell. Analytics in Higher Education: Establishing a Common Language Educause.
- [4] Christos Vaitsis, Vasilis Hervatis, Nabil Zary. Introduction to Big Data in Education and Its Contribution to the Quality Improvement Processes. Intech 2016, 10.5772/63896.

[5]<https://www.allerin.com/blog/4-ways-big-data-is-transforming-the-education-sector>.

[6]<https://datafloq.com/read/big-data-will-revolutionize-learning/206>

[7] Shikha Anirban. Big Data Analytics in the Education Sector: Needs, Opportunities and Challenges. International Journal of Research in Computer and Communication Technology, 2014.

## BIOGRAPHIES

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