# Applications, challenges, future directions and perspectives of big data analytics in present context

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**Abstract:**

Big data is the study of extremely large, intricate, and unstructured data that is gathered from many different sources. These days, it is a critical issue to handle and manage the data for the analysis of necessary information in order to save time and money. The organization can benefit from the data extraction in a number of ways. Business enterprises must make a lot of judgments based on this enormous amount of data. These choices support future forecasting for numerous organizations, including businesses and social networking sites. In-depth discussions of many big data topics and big data analytical methods have been conducted in this work. In this book, the numerous big data analytic tools and approaches have also been covered. The ability to analyze huge data has become a reality thanks to computational methodologies, convenient data collection methods, and embedded data collection within educational technologies. We are beginning to see significant uptake in many areas of education as we get past proof-of-concept applications and demonstrations of approaches. The evaluation, personalized learning, and precision education are the core research trends in the fields of big data and AI. The use of model-driven data analytics methodologies to direct the creation, interpretation, and validation of the algorithms will rapidly expand. However, it goes without saying that conclusions from educational analytics should be used with caution. The government should be committed to promoting lifelong learning, providing teacher preparation programs, and safeguarding individual data at the level of education policy. Relationships that are reciprocal and mutually beneficial should be built in the education sector to improve industry-academia cooperation. Along with future study areas and initiatives in this particular subject, we also talked about numerous difficulties encountered when analyzing huge data. Big Data analytics is a new and very important area of study nowadays, it has been concluded. Applications for big data analytics can be found in many different industries. The review of the studies conducted by various authors has also been briefly reviewed. This review paper's goal is to assist students and researchers who are interested in Big Data Analytics but have no prior experience in the field. The obstacles highlighted here can be overcome by the reader of this work, allowing them to investigate this area of big data analytics and go easily toward their further research.

**Keywords:** Data analytical methods, validation of the algorithms, computational methodologies

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**Introduction:**

What is not digitalized based on what we see around us? We regularly discuss and exchange information and ideas across social platforms like Facebook, YouTube, etc. as we move around with our GPS-equipped smart phones. Additionally, we carry out a specific quantity of online transactions each day. The main point is that anything we do that involves a digital action leaves a digital trace because it is happening all over the world. From a distance, we can see that enormous volumes of data are being acquired and communicated by sensors installed in industrial machinery and facilities. This is happening on a personal level as well. Big Data refers to vast quantities of extremely complicated data that are constantly growing as a result of widespread technological use. Using standard methods, it is difficult to extract the pertinent data from such a complicated and large amount of data. One of the numerous drivers driving the various current trends of digital transformation, including as artificial intelligence, data science, and the Internet of Things, is big data, or the enormous volume of data. Businesses are quite good at

predicting what a specific type of customer will want to buy and when. This is something that online retailers have been using to draw customers and boost sales. The similar thing happened with Starbucks; the coffee firm discovered the pattern based on how its sales behaved. In fields like medicine and healthcare, where a sizable number of medical records are examined to identify patterns, big data is also useful. These patterns also aid in the early diagnosis of diseases and the creation of new pharmaceuticals. As a result, it is clear that Big Data is developing quickly. In order to conduct better and more intelligent searches, we must make use of these new data torrents. Big data has applications in many different fields of study, including telecommunications, data sciences, social set analysis, business intelligence & decision-making for customer evaluations, market trends analysis, and the development of predictive models.

This paper is structured so that a reader may quickly grasp the idea of big data analytics and proceed to further research in the field. The idea of big data, along with its attributes and varieties, were briefly covered in section one. The need for and applications of big data analytics have then been thoroughly examined. Review of the research conducted by various researchers is presented in section II. The purpose of this paper is to inform readers of current trends in the Big Data industry. The other goal of this essay is to highlight the difficulties in analyzing big data and the potential future of this field of study. Big Data analysis is crucial to the growth and future investments of business enterprises. To extract the appropriate data, a variety of Big Data analytical tools and techniques have been employed. The data may be in many different formats. Structured, Semi-structured, and unstructured are the three main categories that it might fall under. Big data and artificial intelligence (AI) technologies are developing quickly, and this has had a significant impact on all facets of human civilization, including the economics, politics, science, and educational systems. We are able to continue many of our social activities despite the COVID 19 outbreak in great part because of these improvements. Big data has been created across many different locations via digital tools, platforms, apps, and human communications. The goal of big data technology is to use massive amounts of data, whether in real-time or not (Daniel, 2019). The four V's, which describe big data's distinguishing characteristics, are frequently used. That is, quantity (the total amount of data), variety (the range of data sources and types), velocity (the rate at which data are produced and transmitted), and veracity (the truthfulness and dependability of the data) (Laney, 2001; Schroeck et al., 2012; Geczy, 2014). Value, the fifth V, was recently added (i.e., that data could be monetized; Dijcks, 2013). Large and complex datasets are challenging to process and employ using typical data management strategies due to the inherent big data characteristics (the five Vs). In order to acquire, store, distribute, analyze, and manage big data, new and inventive computational tools are needed (Lazer et al., 2014; Geczy, 2015). Large datasets are typically collected, analyzed, and evaluated as part of big data analytics. The primary advantages of the big data revolution are frequently seen as the ability to extract useful knowledge and feasible patterns from data (Mayer Schonberger and Cukier, 2013; Jagadish et al., 2014). Statistical analysis, data mining, data visualization, text analytics, social network analysis, signal processing, and machine learning are just a few of the technologies and methods used in big data analytics (Chen and Zhang, 2014).

**Structured Data:**

Data that has been properly structured. It is often present as rows and columns and is occasionally referred to as labelled data. Either humans or machines can produce this kind of data. Only 20% of the data currently in existence is structured data.

**Semi-Structured Data:**

It is neither organized nor unstructured, as its name suggests. Data is typically complex and challenging to comprehend because it is not presented in an ordered manner. Typically, it is data derived from logs, emails, and other sources. In general, it provides little valuable information.

**Unstructured Data:**

It is an exact opposite of structured data. It is in no way organized. The challenge of extracting information from this kind of data is highly complex and difficult. These forms of data are essentially refined using big data analytical approaches. In this format, 80% of the data is available. The analysis of this type of data can also be done using machine learning techniques.

**Characteristics of big data:**

Big Data can be categorized into five characteristics that are called as 5V's of Big Data i.e. Volume, Velocity, Variety, Veracity, Value.


**Above image showing the major characteristics of big data**

**Volume (Data in rest):** In order to acquire insight into it, companies and scientists research and analyze vast amounts of data. This information is gathered from sensors, business transactions, and social media networks.

**Velocity (Data in motion):** In the era of digitization, data volume isn't always as crucial as data generation pace. For instance, about 72 hours' worth of video files are posted to YouTube every minute. How to manage this data in an appropriate and effective way is urgently needed.

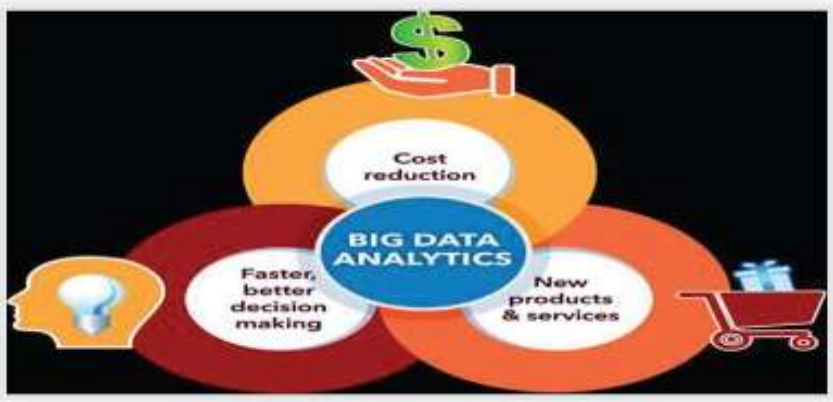
**Variety (Data in many forms):** We have access to data in a variety of formats. We get information from online databases, social media platforms, etc. Additionally, we have access to this data in a variety of formats, including quantitative data, text documents, emails, films, audios, and transactions.

**Veracity:** The accuracy of the findings reached after research and analysis may be impacted by the inconsistent and unclear nature of the available data.

**Value:** The primary goal of big data analysis is to uncover relevant data that will aid in prediction and decision-making.

**Importance of Big Data Analytics:**

Big Data Analytics enables businesses and organizations to manage the massive amounts of data and discover new business development prospects. Big Data is important, according to IIA Director of Research Tom, as shown in the figure below.




**Above image showing importance of big data analytics**

- **Decrease in cost:** Big Data analytical tools aid in the reduction of massive amounts of data and the extraction of usable information, which increases system efficiency and lowers the cost of processing that data. Examples include Hadoop Map Reduce and cloud analytics.
- **Efficient Decision making**: Big Data analytics techniques and technologies facilitate quick and precise decision-making, assisting businesses in foreseeing future market trends.
- **Evolution of New product & Services:** As Big Data Analytic approaches aid in identifying customer interests, firms are better able to work and develop new services for their clients, which may have a big impact on the expansion of their business.

**Applications of Big Data Analytics:**

Big Data analytics has applications across a range of study fields, as was previously mentioned. Some of them are covered in the paragraphs below.

- **Big Data in Education Industry:** The educational system maintains extensive databases of information about students, teachers, courses, etc. Better judgments may be made in many different fields with the help of big data analysis, which will lead to efficient operations and boost overall performance. Several areas where big data has aided in change include:
- **Customized and Dynamic Learning Programs:** The learning packages are tailored based on the student's history to ensure optimal learning. This also helps students achieve better achievements.
- **Grading Systems:** The improvement of the grading systems has also benefited from student data analysis.
- **Reframing course Material:** A course is created with the sole intention that the learner learns and advance their knowledge. One may closely monitor what and how well a student is learning with the aid of student data. Data analysis can therefore assist in changing the course material for improved learning.
- **Career Prediction:** The genuine interests, areas of weakness, and capabilities of the student are revealed by a careful review of their data. As a result, one can assist in forecasting a student's suitable career possibilities. Any student can use this study to identify the ideal career for them.

**Challenges in big data analytics:**

Big Data is a broad term for enormous amounts of data that are extremely challenging to analyze and store. Utilizing a variety of methodologies, big data analytics is used to examine big data and transform it into processed and usable form by deleting redundant and unimportant data. Big Data cannot be manually processed. Big Data analytical techniques provide a number of benefits, but they also present a number of obstacles, which is a very severe problem. Some of the problems involve data security and privacy, intricate coding, challenging implementation, etc. Researchers should concentrate more on coming up with the best, most efficient ways to address those problems. The difficulties can be roughly divided into three categories, which are addressed below.

**Data Challenges:**

The main challenge is to handle Big Data storage, processing and to discover hidden patterns among those data. The main data challenges that need to be focused are:

- Data Storage
- Velocity of Data
- Data Variety
- Computational power of data
- Data Understanding
- Quality of Data
- Data Representation

**Management Challenges:**

Big data technologies are now present in many business sectors. Therefore, it is crucial for them to select the best Big Data analytics approaches and to profit the most from them. The business must handle the adjustments promptly. Among the difficulties are:

- Leadership
- Talent Management
- Management of Technology
- Decision taking capability
- Environment of company

**Process Challenges:**

Although the specialists can fully examine the model based on prior experiences, there are still some areas where they fall short, which makes processing big data challenging. Choosing the best model for the data analysis is a difficult undertaking that requires careful consideration. The following are the process challenges:

- To capture the Data from various sources
- Conversion of collected data into analyzable form
- Discovering the hidden patterns among the data
- Analyzing the scope of techniques required to filter the data.

**Conclusion:**

We go into great detail in this essay about the idea of big data analytics. Big Data was first thoroughly covered in Section I, along with its properties. Following that, the idea of big data analytics was covered. Big Data Analytics' uses and value have been exhaustively discussed. We also concentrated on the current state of big data analytical tools. After that, the difficulties standing in the way of big data analytics have been listed. The most recent research conducted by different researchers, along with its advantages and disadvantages, has also been reviewed. It has also been discussed how machine learning techniques fit into the big data world. We can state as a conclusion that Big Data Analytics has both positive and negative effects. The most recent topic of research in the field of big data processing is called big data analytics. Big Data analytics is helpful in many industries, including education, healthcare, agriculture, and the military, banking, and business organizations in particular. Future research can focus on figuring out how to overcome the many obstacles standing in the way of big data analytics. Designing innovative methods and algorithms for the processing of big data can still be done. By creating innovative methods, the collecting of data from various sources can be improved. Data security concerns, which were not addressed in this paper but are highly important and should be highlighted, should receive more attention. We haven't offered any solutions to the problems that Big Data Analytics is now facing. Researchers can carry out more research in the future to address the problems covered in this paper. Instead than looking at static past data, methodologies should be created for the study of real-time data.

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