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Research Article

REAL-TIME DATA VALIDATION: THE POWER OF BIG DATA ANALYTICS

Chinedu Anthony Okeke

Department of Computer Science, Institute of Management and Technology (IMT), Enugu, Nigeria

Abstract

Big data is related to the extraction of large and complex data into meaningful data which cannot be extracted or analyzed by traditional methods. Storing and retrieving vast amount of structured as well as unstructured data at desirable time is undergoing challenges in the big data and real time system. Big data analytics serves as a powerful catalyst for business growth and performance optimization. By transforming raw data into actionable insights, it empowers businesses to make informed decisions-makers and enhance customer experiences. The process of big data analysis involves identifying trends and patterns within data sets, thereby facilitating the extraction of meaningful conclusions. Information verification provides accurate, clean, and complete information that has been eliminated data errors and ensure that the data is not corrupted. Big data anlytic system was discussed in this paper as a tool for real-time information verification and as means of overcoming the limitations in handling and processing large amounts of data using conventional storage techniques, in order to provide accurate and reliable information effective for jurdiscious management of organization and decision-making. This paper was able to discuss conceptual/theoritical framwork, big data analytic processes, types, clasification, methods and its importances of big data analytic system.

Keywords: Analytic, Analytic System, Data, Big Data, Big data analytic, Information, Information Verification, Verification.

Introduction

Big data are created, read, updated, deleted, or processed by applications in serval ways and forms. This data could be generated via web apps, android apps, iOS apps, or any applications whatsoever. Due to a varied diversity in the kinds of data being used, determining the storage approach is a little nuanced. Big data are generated every day by users and in the internet. Managing such volumious outsourcing data is increasingly difficult (Abhay & Dhanya, 2020). So, to manage such huge complex data, big data was introduced to overcome the challenges and limitations of accessing and retiriving data for deceision-making. With the explosion of data, early innovation projects like Hadoop, Spark, and NoSQL databases were created for the storage and processing of big data. This field continues to evolve as data engineers look for ways to integrate the vast amounts of complex information

created by sensors, networks, transactions, smart devices, web usage, and more (Waller & Fawcett, 2020). Even now, big-data analytics methods are being used with emerging technologies, like machine learning, to discover and scale more complex insights. This system intends to normalize inputted data, clean the inputted data, model the inputted data and pre-process the inputted data using natural language processing in order to accurately verify data in real-time (Adam, 2023). Big data analytics describes the process of uncovering trends, patterns, and correlations in large amounts of raw data to help make data-informed decisions. Even now, big data analytics methods are being used with emerging technologies, like machine learning, to discover and scale more complex insights. The term "big data" has gained popularity over the past ten years, mostly because it offers a never-before-seen chance to extract information that can improve outcomes. In an effort to obtain a competitive edge, this is driving companies to invest in big data analytics capabilities Companies are starting to question "what do we know" rather than "what do we think" as they become more data-driven (McAfee & Brynjolfsson, 2019). It is arguable that the increased availability of insights from big data analytics is altering both the traditional organizational decision-making process and the competitive landscape of many businesses, (El Houari et al., and 2022). Organizations today have a chance to flourish if they can effectively interpret this freshly generated knowledge and derive benefits from big data analytics. In many industries, the ability to make this change will separate the winners from the losers (Waller & Fawcett, 2020). Information verification is the process of ensuring that data is accurate and comprehensive. In order to verify that the information is accurate and unaltered, it is compared to a trustworthy source (Aspena, 2021). Finding and fixing any mistakes or inconsistencies that may be present in the information is the aim of information verification. Manual checks are one method of information verification. Another way to accomplish information verification is through automated processes, including using software tools that can compare and evaluate information against a reliable source. Information validation and verification are two essential processes that ensure the accuracy and reliability of information insights. Information verification comprises checking the data for quality and completeness, whereas information validation involves ensuring the data meets predefined standards or criteria. Data verification is a continuous process that has to begin during the collection of data and continue through data entry and analysis. Data quality assurance is the process of profiling the data to find errors, incompleteness, and other anomalies in the data, as well as carrying out data cleansing, data aggregation, data transfer, and other tasks to enhance big data quality (Mannino & Effelsberg 2020). Big data quality assurance, in its broadest sense, is the study and implementation of diverse assurance procedures, techniques, standards, requirements, and frameworks to guarantee the quality of big data with respect to a predetermined set of quality metrics. Either by regularly moving substantial volumes of data to a physical data warehouse or just retrieving data from the sources upon request is necessary for real-time information verification and integration of heterogeneous data sources.

The drawback is that when data volumes are large, it degrades performance and increases network traffic. Big Live Data refers to data sets that are updated in real time and are large not just in terms of their byte count but also in terms of their ownership and responsibility across several domains (Fatima et al., 2020). Computer business system responds to transactions by immediately updating the appropriate databases. Real-time information systems generate a response fast enough to prevent human operators from waiting very long (Altman, 2019). Decades ago, when computers were considerably slower than they are today, real-time was occasionally indicated in a request for proposal (RFP) for a business application to highlight fast response times. In addition, streaming analytics applications are becoming common in big data environments as users look to perform real-time analytics on data fed into Hadoop systems through stream processing engines (Hilbert & Lopez 2021). Big data is a concept that refers to the accumulation of enormous volume of data that is generated from every aspect of daily life (Hu & Meng, 2020). This growth is so fast and powerful that humans cannot store data and manage data without the help of specialized technology and data analysis tools. By taking advantage of this huge amount of information, big data provides significant opportunities for enterprises to gain needed insights and strengthens decision-making. Health care data is any kind of data relating to health conditions, quality of life, and health outcomes. Health care data can be produced by everything from wearable devices like smart watches to patient records and medical imaging technology (Srujani & Priti, 2020). As a result, health data can be used to track the quality of care provided by healthcare systems, provide guidance for clinical decision making, and even track risk factors that may be warning signs a patient could develop a particular medical condition, among other things. Health data provides benefits to patients, health care professionals, health facilities, and health systems. Big data have drastically improve treatment by predicting outbreaks faster, personalizing medicine for patients, optimizing hospital operations, and empowering lifesaving breakthroughs, (Segun et al., 2020). From cost savings to life savings, big data would drastically improve healthcare delivery and outcomes for providers and patients alike. Computer system that responds to transactions by immediately updating the appropriate databases can be seen as a real time system (El Houari, 2022). Real-time information systems generate a response fast enough to prevent human operators from waiting very long. Decades ago, when computers were considerably slower than they are today, real-time was occasionally indicated in a Request for Proposal (RFP) for a business application to highlight fast response times. Real time means to occur immediately within specific time (Hu & Meng, 2020). It is the actual time during which something takes place. This term is typically used as an adjective to describe a level of computer responsiveness that is immediate in a human sense of time. Since execution follows the command, true real time is unachievable, since the delay is still there even if it is microseconds. Near real time is a commonly used term used to express this. Realtime programs must guarantee response within specific time constraints known as deadlines. The Real-Time Single Transaction Applications allows verifying information on demand as

a user enters it into web form or mobile application (Urquhart et al., 2019). It flags invalid contact information at the point of collection and prompts the user for a correction in real-time. It will not be wrong to say that Big Data, which is a combination of real time data, network data, time series data etc, has played a crucial role in the evolution and successful outcome of ideas and options in the media and entertainment sector. Media and entertainment has become an integrated part of the lives of people, meaning that people nowadays are very enthusiastic about trying new content in terms of watching it and choosing it (Hilbert & Lopez 2021). Gone are the single-channel days of no choice and no integration and consultation to viewers. But now these dynamics are changing, there are millions of watching options to choose from and they are also available to be streamed across various devices and are really getting user friendly (Waller & Fawcett, 2020). Almost everyone uses some sort of social media, whether it is Facebook, Instagram or even LinkedIn. These platforms serve as outlets for people to express their ideas, creativity, opinions, and information instantaneously. It bridges a connection between people all over the world.

1.2 Statement of the Problems

Big data potential power is so great, but has its own weaknesses that businesses, organization, data analyst and software developres need to pay attention to. Part of the negative aspect of big data arises from its nature. The rest comes from whether the business has enough potential to handle big data analytics challenges or not. This study was able to identify the following problems:

1) IT Infrastructure Hazard: Organizations definitely cannot use traditional methods or simple IT infrastructure because they have a higher risk of system failures and network crashes.

2) Data Security: Security is the biggest concern of big data from the unwanted attention of malicious hackers.

3) Data Quality Issues: Without cleaning and filtering, big data can experience quality problems with high volumes of data coming in from a variety of sources and formats, they may be faulty, duplicates, errors, absences, conflicts, and inconsistencies, irrelevant, and unwanted data**.** Big data require significant time, effort and resources to properly maintain it.

4) Data Accessibility: Collecting and processing big data becomes more difficult as the amount of data grows on daily basis.

5) Data Scientists Requirement: Big data analytics is a complicated process that cannot be performed without the help of technical expertise-skilled data professionals.

6) Trend in Technology: As technology constantly evolves rapidly, selecting from the vast array of big data analytics tools, organizations are NOT always in a state to adopt and invest in new technologies in order to remain competitive and maximize the benefits of big data analytics system.

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1.3 Objectives of the Study

The aim of this study is to outline big data analytic system for real-time information verification, while the following objectives would be considered in order to achieve the aim of the study:

i) Analyse big data analytics processes for information verification. ii) Analyse types of big data analytic for information verification. iii) Analyse classification of big data analytic mehtods for information verification. iv) Analyse types and methods of big data analytic system used in information verification. v) Evaluate the importance of big data analytic in information verification.

2.0 Conceptual/Theoretical Framework of the Study

This section discusses relevant theories which support the study. Theoretical Framework of the Study and Conceptual Framework of the Study were discussed. The key factors to consider when selecting a big data framework are:

Processing needs: Batch processing, real-time processing or a combination of both.

Data types**:** Structured, semi-structured, or unstructured data.

Scalability: Ability to handle growing data volumes.

Integration: Compatibility with existing data infrastructure and tools.

Technical expertise: In-house skillset for framework implementation and maintenance.

2.1. Conceptual Framework of the Study

Data can be seen as stored information and recorded operations in the computer in various forms. Big data can equally be as the same data being present in huge amounts and numbers. This consists of information provided by both humans and devices. Big data is the collection of the data which is also growing exponentially with time (Abhay & Dhanya, 2020). Big data is large and complex in its size and storage that it is unable to be deciphered and understood efficiently by the traditional data management tools. Big data is the term used to describe data sets that are too big or complicated for conventional data-processing application software to handle. While data with more features or columns and higher complexity may result in a higher false discovery rate, data with many entries (rows) give greater statistical power. The best interpretation is that it is a vast body of information that cannot be understood when used sparingly, even though it is occasionally used loosely due to a lack of official definition (Hilbert & Lopez 2021). Data collection, data storage, data analysis, search, sharing, transfer, visualization, querying, updating, information privacy, and data source are some of the problems associated with big data analysis.

Three fundamental ideas were initially connected to big data: volume, variety, and velocity. Big data analysis makes sampling difficult, which previously limited the options to observations and sample. Thus, the quality or perceptiveness of the data is referred to as a fourth term, truthfulness. The volume and variety of data might result

in costs and dangers that surpass an organizations ability to generate and extract value from big data if insufficient investment in expertise for big data veracity is made (Hilbert & Lopez, 2021).

2.2 Theoritical framework of the study

The inductive theory of big data states that "big data is comprised of abundant and everincreasing trace data, offers boundless opportunities for a computational social science (Hu & Meng, 2020). The social sciences might undergo a revolution because of this extraordinary amount of trace data. Researchers may be able to bypass certain pre-existing latent notions and produce richer and more precise understandings of social life by applying direct algorithm attention to trace data. Latour claims that scholars can now immediately access a vast amount of empirical phenomena and gain insights closer to the source (Segun et al., 2020). Big data necessitates new visualizations and the ability to recognize patterns, yet there is lack of general direction on how to handle this abundance of data (Urquhart et al., 2019). Although big data presents a chance to develop new theories, researchers who want to do so have few methodological choices. The information system fields review process has included inductive theory as a rigorous and better-understood method in recent years, and there is a wellestablished discover regarding the thoughtful and appropriate application of inductive theory (Hilbert & Lopez 2021). These current patterns suggest that information systems approach is maturing. But as this discipline matures, it is crucial to steer clear of the dogmatism that occasionally results from the construction of discourses in the information systems domain. When the debate should be changing and keeping relevant, dogmatism has the potential to shut it down (Boyd & Crowford, 2017). The inductive theory of big data supports this study with the provision of an awareness framework on the importance of big data analytics (Urquhart et al., 2019).

2.2.2 Big Data Theory

Storage and retrieval of vast amount of structured as well as unstructured data at desirable time lag is a challenge, according to the big data theory. The phrase "big data" first appeared as a result of some of these limitations in handling and processing large amounts of data using conventional storage techniques. Even if big data has become more popular since the Internet's inception, it cannot be compared to it. Though it goes beyond the Internet, the Web facilitates the collection and exchange of raw data as well as knowledge. Big Data is the ability to store, process, and understand data so that it may be utilized to anticipate future course of action with a high degree of accuracy and a reasonable amount of lead time, proposed the theory (Boyd & Crowford, 2017). Target marketing is the goal of marketers, individualized insurance is the focus of insurers, and patient-centered, high-quality, reasonably priced care is the focus of healthcare providers. It is crucial to comprehend the underlying driving and regulating factors (market, law, social norms, and architecture) in order to develop robust models that can handle big data and still produce high prediction accuracy, even with the advancements in data storage, collection, analysis, and algorithms related to predicting human behavior (Boyd & Crawford, 2017). In order to efficiently

create business rules even for massive data sets, big data analytics is now and increasingly focusing on classic methods like pattern mining, decision trees, rulebased systems, and other data mining approaches. It can be done by creating algorithms that make use of in-memory computing, distributed data storage, or cluster computing for parallel processing. Grid computing, which was formerly used for similar tasks, has recently been surpassed by cloud computing. The inductive theory of big data supports this study with the provision of an awareness framework on the importance of big data analytics.

3.0 Findings

In this section of the study the following issues such as big data analytics processe, types, classification, methods and importance were discovered and discussed below in details.

3.1 Big Data Analytic Process

Big Data analysts**,** engineers or scientists, creates data pipelines that help to set up the model for big data analysis. This big data analytics can be achieve through the following processes:

1. **Data Collection Process:** This is the first step of big data analytic process, raw data are collected for analysis purposes. It consists of two steps in which data collection can be done. If the data are from different source systems then using data integration routines the data analysts have to combine the different data whereas sometimes the data are the subset of the data set. Then, the data analyst would perform some steps to extract the useful subset and transfer it to the other section in the system.
2. **Data Cleansing Process:** at the end of data collection, the next step is to clean the quality of the data as the collected data consists of a lot of quality problems such as errors, duplicate entries and white spaces which need to be corrected before moving to the next step. By running data profiling and data cleansing tasks these errors can be corrected. The analysts organises the data according to the needs of the analytical model in use.
3. **Data Analysis and Data Interpretation Process:** Big analytical models are created using software and other tools which interpret the data and understand it. The tools are Python, Excel, R, Scala and SQL. These models are tested again and again until the model works as it needs to be in production of the data set and would be executed simulatanuosly against the existing model.
4. **Data Visualisation Process:** Is the process of creating visual representation of data using the plots, charts and graphs which helps to analyse the patterns, trends and get the valuable insights of the data. Data analysts find the useful data from the raw data by comparing the datasets and analysing them.

3.2 Types of Big Data Analytics

There are four main types of big data analytics that support and inform different business decisionsmakers which are **Descriptive, Diagnostics, Predictive analytics and Prescriptive analytics**:

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1. Descriptive Analytics: Descriptive analytics refers to data that can be easily read and interpreted. This data helps create reports and visualize information that can detail company profits and sales. For instance, during the pandemic a leading pharmaceuticals company conducted data analysis on its offices and research labs. Descriptive analytics helped them identify unutilized spaces and departments that were consolidated, saving the company millions of dollars.
2. Diagnostics Analytics: Diagnostics analytics helps companies understand why a problem occurred. Big data technologies and tools allow users to mine and recover data that helps dissect an issue and prevent it from happening in the future. For instance, a clothing company's sales have decreased even though customers continue to add items to their shopping carts. Diagnostics analytics helped to understand that the payment page was not working properly for a few weeks.
3. Predictive Analytics: Predictive analytics looks at past and present data to make predictions. With artificial intelligence (AI), machine learning, and data mining, users can analyze the data to predict market trends. In the manufacturing sector, companies can use algorithms based on historical data to predict if or when a piece of equipment will malfunction or break down.
4. Prescriptive analytics: Prescriptive analytics provides a solution to a problem, relying on AI and machine learning to gather data and use it for risk management. Within the energy sector, utility companies, gas producers, and pipeline owners identify factors that affect the price of oil and gas in order to hedge risks.

3.3 Classification of Big Data Analytics Methods

Big data analytic methods are classified into two major categories, which are qualitative and quantitative classes.

a. **Qualitative Big Data Analysis:** These data are derives from the words, pictures and symbols. They are not derived from statistics. Examples of qualitative big data analytic methods are:

- Narrative Analytics: It uses data acquired from diaries, interviews and so on for its analysis.
- Content Analytics: It uses verbal data and behaviour for analysis.
- Grounded theory Analytics: It uses some given event to study, explain and analyse big data.

b. **Quantitative Big Data Analysis:** These data are collected and processed into numerical data form. Examples of quantitative big data analystic methods are:

- Hypothesis testing: It assesses the given hypothesis of the big data set.
- Sample size determination: It takes small sample from a large group of people and perform analysis.
- Average or mean of a subject is dividing the sum total numbers in the list by the number of items present in that list.

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3.4 Big Data Analytics Methods

There are many big data analytics methods applicable depending on the type of information an organization desires will determine the method to employ in order to provide the desired output. The most effective methods are Data mining, Predictive Analytics, Deep learning and others.

a) Data mining: It sorts through large datasets to identify patterns and relationships by identifying anomalies and creating data clusters. It passes through data sets in search of patterns and relationships. Data mining is also known as knowledge discovery in data (KDD). It processes, uncovers, patterns and other valuables information from large data sets. Data mining is the process of searching and analyzing a large batch of raw data in order to identify patterns and extract useful information (Avinash et al., 2020). This process turns sources data into something useful. Companies use data mining software to learn more about their customers. It can help them to develop more effective marketing strategies, increase sales, and decrease costs. Smart companies use data mining techniques to gain insights into their customers' habits, improve their marketing strategies, and further their business. The four stages of data mining are: (1) Data acquisition, (2) Data cleaning, preparation, and transformation, (3) Data analysis, modeling, classification, and forecasting; and (4) Reports.

b) Predictive Analytics: This process uses data to forecast future outcomes. Is a form of technology that makes predictions about uncertain known in the future for better decision making. Companies use to employs this predictive analytics to find patterns in this data to identify risks and opportunities. It builds models to forecast customer behavior and other future actions, scenarios and trends. Organizations use predictive analytics tools for fraud detection, marketing, risk assessment and operations. It uses an organization’s historical data to make predictions about the future, identifying upcoming risks and opportunities. The process uses data analysis, machine learning, artificial intelligence, modeling and statistical algorithms to find patterns that might predict future behavior.

c) Deep Learning: This is a branch of Artificial Intelligence (AI) that involves using neural networks to learn from data and perform tasks that would otherwise require human intelligence. It has been behind some of the most impressive achievements of AI in recent years such as facial recognition, natural language processing, self-driving cars, and morethis is a more advanced offshoot of machine learning. It imitates human learning patterns by using artificial intelligence and machine learning to layer algorithms and find patterns in the most complex and abstract data (Nwankwo, 2023). Deep Learning algorithms can handle both structured and unstructured data such as images, text, audio, video, and tabular data. This enables it to integrate multiple sources of information and leverage their complementary strengths. Deep Learning algorithms can deal with large and complex datasets that would be challenging for traditional Machine Learning algorithms to handle. This makes it useful for finding insights from big data, such as posts on social media, webpages, videos, audio files, and sensor

data. The importance of Deep Learning, lies in it ability to solve many problems that are difficult or impossible for traditional algorithms or human experts (Nwankwo, 2023). It can handle large and complex data sets, such as images, videos, audio, text, and more. It can also learn from unlabelled or unstructured data, which means it does not require human intervention or supervision to extract useful information. Moreover, Deep Learning can learn to perform tasks that are beyond human capabilities, such as generating realistic images, composing music, or playing games. Thus, it becomes a crucial aspect of our day-to-day lives in many ways. Deep Learning can be used for predictive modelling. Predictive modelling is the process of using historical data to make predictions about future outcomes. This can help business and organisations make better decisions and optimise their operations. The Importance of Deep Learning also lies in discovering non-linear relationships in data that would be difficult to detect through traditional methods.

3.5 Importance of Big Data Analytics

Data analytics consists of many uses in the finance industry. It is also used in agriculture, banking, retail, government and so on. Some of the main importances of big data analytic system are:

- It is concerned with audience of the business by identifying the trends and patterns from the data sets. It can also improve the businesses to grow and optimise its performance.
- It shows the areas where business needs more resources, products and money and where the right amount of interaction with the customer is not happening in the business. Thus by identifying the problems then working on those problems to grow in the business.
- It helps in the marketing and advertising of the business to make it popular and thus more customers will know about the business.
- Useful and important information which is taken out from the raw data can bring advantage to the organisation by examining present situations and predicting future outcomes.
- Businesses can get better by targeting the right audience, disposable outcomes and audience spending habits which helps the business to set prices according to the interest and budget of customers as at when needed.

Conclusion

It will not be wrong to say that big data is a combination of real time data, network data and time series data. Big data analytic has played a crucial role in the evolution and successful outcome of ideas and options in the media and entertainment sector. Big data analytics refers to a process that is used to extract meaningful information such as market trends, hidden patterns, customer needs, and unknown correlations. It is a form of advanced analytics that mainly involves complex applications with elements such as statistical algorithms and predictive models**.** Big data analytics is used in businesses, and organizations in the form of big data analytics software and systems to make data-driven decisions. The market of big data analytics is expected to rise shortly as big data analytics is

important because it helps companies leverage their data and also identify opportunities for better performance. Big data analytics is high in demand because it provides better customer service, and improves operational efficiency. Big data analytics is used to develop personalized marketing campaigns to increase the profit margins and the revenue of the businesses.

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