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Overview of Big Data Technology Development

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Abstract

The surge of the third wave of information technology has created the era of big data analysis, and a variety of big data analysis methods have emerged at the historical moment, which has a vast impact on human work activities. In this paper, the development history, basic concepts, and influences of China's big data processing and the primary process and application of China's big data processing technology are stated in detail. The theory of big data processing technology in this paper also provides learning resources for many learners

Keywords

Big data processing, big data analysis methods, big data technology.

1. Introduction

With the surge of the third wave of e-commerce, the era of big data analysis is coming. The development of human information technology will provide a more powerful technological guarantee for the arrival of the age of big data. The change of human information generation mode has also become the key reason for promoting the arrival of the era of big data. Undeniably, the development of big data technology has profoundly impacted the economy, science, technology, and people's clothing, food, housing, and transportation. Due to the rapid development of Internet information technology in recent years, big data technology has attracted people's attention.

As for big data, as early as 1980, Alvin Toffler, an American futurist, called it "the cadenza of the third wave of science and technology" in his book The Third Wave [1]. In October 1997, NASA scientists Michael Cox and David Ellsworth submitted the paper "Using Control Programs to Request Page Scheduling for External Memory Model Visualization" to the Academic proceedings of the 8th Institute of Electrical and Electronics Engineers Conference. It is also the first academic paper to use the concept of "big data" in ACM's Big Digital Library. 2000 to 2010 is the founding year of the "big data era." Doug Lenny published a report in February 2001 titled "3D Data Management: Controlling Data Content, Data Processing Rates, and Data Analysis Types". More than ten years later, the 3V standard has become the standard language for defining big data and has been widely accepted by society. In September 2005, Tim O 'Reilly wrote in his paper that "data will be the next technology" [2]. Science launched a special issue on big data in 2008; At the same time, the Computing Community Alliance elaborated in literature [3] that under the background of data-driven, it intends to solve the technical problems of big data and the many challenges it faces.

With the development of Internet information, Internet of Things information, cloud computing technology, and so on, the concept of "big data" has also been attached to significant information technology industries along with the rise of the Internet. "The most important change in the Information Age is to abandon the pursuit of relationships and instead focus on information," Viktor Mayr Schoenberger wrote in his 2011 book, The Internet and Information Age: The Great Transformation of Human Life, Management, and Thinking. This means that people need only understand the "what," not the "why" It has overthrown thousands of years of cultural concepts and traditions, brought new shocks to people's ways of understanding and

communication with the outside world and caused a substantial social sensation. In May 2011, the American McKinsey Global Institute published an analysis report arguing that the new era of "big data" was coming and conducted a detailed analysis of its impact, key technologies, and application areas [4]. McKinsey research report published later, big data analysis techniques in the field of computer technology has a huge shock, EMC, HP, IBM, Microsoft, and other Internet companies are aware of the "big data" the necessity of data analysis, one after another through the acquisition of "big data" and its associated enterprises to conduct technology integration [5].

In addition, the financial sector and the government have also developed a strong affinity for big data. In March 2012, the Obama administration issued a "big data research and development initiative, claim to carry out the "big data development plan", investment of $two hundred million for big data technology-related industries, and gradually developing the national development strategy, seen as the government following the data highway planning after another important measure in the field of information science. In August 2015, The State Council issued the Outline of Action for Promoting Information Engineering Construction, comprehensively promoting the construction and operation of China's information engineering, actively promoting China to build a digital power, and gradually expanding the construction of information engineering as a national strategy. Since then, the relevant aspects of China have formulated some measures to actively guide the engineering construction of China's big data and information industry. In January 2017, the Ministry of Industry and Information Technology issued the Industrial Development Plan (2016-2020) to implement China's big data informatization policy and promote the healthy and rapid development of China's industry. In April 2017, the White Paper on Big Data Security Standardization (2017) was officially issued, which outlined the overall outline of China's big data security from the perspectives of regulations, policies, technical standards, and applications. In April 2018, the first "Digital China" Construction Summit was held in Fuzhou, Fujian province.

2. The basic concept of big data and its impact

With the development of science and technology and the advent of the era of big data, the term "big data" has become one of the most popular words in the Internet industry[6]. The conceptual interpretation of big data is at an abstract level. The most accepted performance is the "4V".They are Volume, Variety, Velocity, and Value, which means a large amount of data, numerous types of data, rapid information processing, and low-Value density. At the same time, the concept of big data is its four characteristics.

The emergence and development of big data have a profound impact on social development, scientific and technological research, way of thinking, employment, and talent training. Regarding economic and social development, relying on the decision-making process of big data analysis, recommendation algorithms, and other technologies promotes the organic integration of computer technology and other social industries and newly applied technologies. In terms of scientific and technological research, big data analysis will usher in the fourth paradigm, data-intensive science and technology, after the three paradigms of empirical science, theoretical science, and statistical science. In terms of the way of thinking, big data breaks the traditional thinking mode of human beings with its three characteristics: "sampling instead of sampling, efficiency instead of precision, correlation instead of causation". In terms of employment and talent training, the rise of big data technology makes major enterprises compete for big data development talents. Universities also actively increase the activity of relevant professionals, set up relevant scientific research units, and improve the existing teaching and research mechanism under various national policies.

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3. The basic process of big data processing

When we talk about big data today, we generally refer to the combination of "data" and "big data technology", not just the data itself. The so-called "big data technology" refers to vast amounts of data information collection and storage and data analysis. Results show that a series of related to information technology, the use of alternative methods for large-scale structured, semi-structured, and unstructured information data analysis, resulting in big data analysis results and the test conclusion of all kinds of information processing and research of new methods.

In discussing big data analysis technology, the basic process of big data analysis should be clear, including data collection and storage, big data analysis, results display, and other basic processes. The steps are shown in Figure 1.

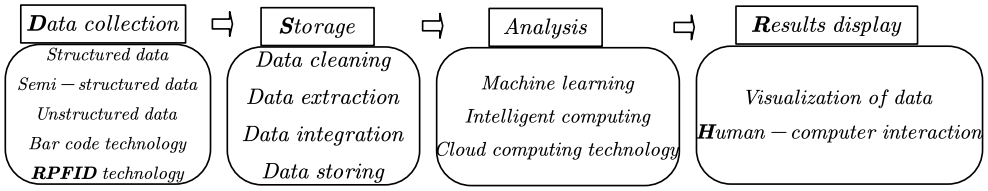

Figure 1: Basic processing flow of big data

4. Application of big data technology

Big data permeates every aspect of life, and big data technology is ubiquitous, which involves manufacturing, finance, automobile, Internet technology, catering industry, telecommunications, energy field, biomedical field, entertainment industry, logistics, security, transportation, urban management, and other major industries. With the continuous progress of Internet engineering technology, it will generate a large amount of data information every moment. However, the purpose of big data is not to master the data itself but to carry out comprehensive mining, processing, analysis, and extraction of data to clean out valuable data conducive to scientific study and calculation. The following will introduce the specific application level of big data technology from the following aspects.

4.1. Security

Security is a critical aspect from the state to the individual. The intellectual development of security has gradually become a significant mainstream of putting big data. Developed countries such as the United States and the European Union have already adopted big data strategies and promoted them as national strategies. The rapid development and extensive application of big data analysis also bring an opportunity to the protection of our financial information security, policy information security, cultural information security, economic and social insurance, technical security, environmental information security, natural resources information security, nuclear information security, military information security, territorial information security, etc.

Government departments can also build national information security mechanisms using big data analysis technology. In this respect, the United States was remarkably prescient. After the 9/11 incident, the US government began using a large number of big data analyses to fight terrorism. In 2013, the head of the counter-terrorism in the US government used voice call technology and big data analysis in his congressional testimony, effectively cracking down on more than 50 terrorist incidents. The public security data resource management platform based on the data resource sharing system provides a platform for urban security monitoring,

technology research, early warning and prediction, auxiliary decision-making, etc. It gives full play to the potential function of data information to improve the level of urban security.

In recent years, a large number of video data has been generated with the continuous improvement of video surveillance systems. The development of image processing technology has been used significantly for so much data information. For example, face recognition technology, tracking technology, license plate recognition, etc., are all products of the comprehensive research of big data technology and image recognition technology. This technique can also be applied to intelligent video surveillance, especially in large-scale malls, railway stations, hospitals, airports, etc. where dense, the public can effectively monitor the abnormal situation, even for some criminals to track, can face recognition and pedestrian recognition technology, and tracking technology for effective positioning capture, this to a certain extent saved the police resources. Police departments can also use big data to analyze crimes and further prevent them.

4.2. Catering

Different from the traditional catering industry operation mode, the current catering industry is also under the two-way impact of the development of the Internet. On the one hand, traditional restaurants accept customers to eat in the restaurant or make table reservations by phone, while most customers now use various catering apps, and each restaurant has detailed food introductions, catering recommendations, customer comments, etc. If operated following the traditional mode, it will only face the risk of bankruptcy. Of course, the current catering mode has also completely changed the traditional way of catering operation. However, for all kinds of Internet catering recommendations, there are also drawbacks. In the past, is through the "people" as the medium of word of mouth, and now the food recommendation ranking will be a variety of preferential means to lure customers into giving praise, and even bad businesses will carry out a large number of praise.

4.3. Medical treatment

The outbreak of COVID-19 in early 2020 threw the world into chaos. The development of big data has brought hope to this chaos. The spread of the epidemic has been effectively predicted by analyzing the infected person from infection to onset and transmission rate. At the same time, using big data technology to screen and isolate close contacts is a practical help to the air defense against the epidemic. At the same time, big data technology also provides excellent help for the development of intelligent medical treatment, people's health management, and other aspects, and even provides specific technical support for the core DNA of life full of mysteries, helping us to interpret DNA further.

4.4. Entertainment

The emergence of big data technology has dramatically changed people's entertainment ways. Even if people stay at home for a long time during the epidemic, they can also find suitable entertainment. For example, the research and development of VR glasses, combined with virtual reality technology, can experience 3D games at home, play table tennis, badminton, and other ball games, and if combined with specific seats, even have a roller coaster experience at home. In addition, using the current big data analysis, entertainment enterprises can analyze people's preferences according to their usual browsing and clicking frequency and provide personalized services to customers with different preferences, such as Douyin video recommendations, Taobao guesses your favorite products, which greatly improves the operation efficiency of the entertainment industry. Even with today's big data, teams can analyze the movements of their opponents to help players analyze and train accurately.

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4.5. Data management

Office in 2012, the White House science strategy of "big data research and development planning", clearly put forward "by collecting, managing, massive and complex information, obtain experience and insights that can improve and accelerate innovation in the field of scientific research, engineering application, strengthening the safety management in the territory, the change of education management and learning mode". This big data management policy of the US government is regulated by the government and guided by enterprises. The US government has also established strict enforcement rules in big data information management, which are constantly updated with social changes.

In June 2022, The General Office of the State Council issued the Guiding Opinions on Strengthening the Construction of a Digital Government (starting now referred to as the Guiding Opinions), making arrangements for actively following the trend of economic and social digital transformation, fully releasing the dividends of digital development, and comprehensively opening up a new situation in the construction of a digital government. The Guideline pointed out that "digital technology should be widely applied to government management services, promote the optimization of the government governance process, model innovation, and performance ability improvement, and build a new form of a digital and intelligent government operation"[7].

It can be seen that in the era of big data, the mature application of big data technology will be a necessary technical guarantee for social development in the future.

5. The relationship between big data, cloud computing, and connectivity

Big data, cloud computing, and Internet of Things technology are IT-leading cities' most advanced technical representatives. They are related and different. At first, cloud computing technology mainly includes the following contents: first, large-scale distributed parallel computing technology based on Google's GFS and MapReduce; The other approach is typically on-demand renting from Amazon virtual machines and object databases. However, after the introduction of big data, distributed computing in cloud computing technology also made big data analysis technology into revenue. For cloud computing technology, its goal is to integrate resources, that is, through the optimization of essential IT resources and further combination, and combined with the network, through the way of service to provide customers with preferential prices, tends to a commercial supply mode. The Internet of Things (IoT) technology locks "everything connected" as its development direction, and its core goal is application innovation. In addition, Internet of things technology is accompanied by the rapid development of cloud computing technology and big data technology produced by the new technology.

Among them, the development of big data needs the support of cloud computing technology as the basis, and big data provides the development space for cloud computing technology to give full play to the technological advantages. The source of data information of big data needs the Internet of Things technology as a guarantee, and the data analysis related to the Internet of things is supported by the relevant technology provided by big data. For the massive information generated by the Internet of Things, cloud computing technology allows it to store a large amount of information. Similarly, for cloud computing, the Internet development platform is in its application stage[8]. The three complement each other and permeate each other.

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6. Conclusion

This paper summarizes the development process of big data technology, introduces related concepts and their influences in various aspects, and explains the basic process of big data processing. Big data technology is widely used, and all walks of life show their talents. With the development of technology and the general trend of the era of big data, we should be more vigilant against all kinds of drawbacks while making use of big data to facilitate all kinds of development.

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