

Research on the Application of Computer Science and Technology in the Context of Big Data

Meng Zhang*

Beijing Zhongchuang Carbon Investment Technology Co., Ltd., Jiangsu Branch, Nanjing 210049, Jiangsu Province, China

*Corresponding author: Meng Zhang, zhangmeng202412@163.com

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Abstract: Computer science and technology play an important role in people's lives and work, especially in the era of big data. The application of computer science and technology is conducive to improving people's production and living standards and provides a strong impetus for China's social and economic development. Therefore, this paper analyzes the application of computer science and technology in the context of big data and puts forward new trends and requirements for its future development, aiming to provide some references for the computer science and technology industry.

Keywords: Computer science and technology; Big data; Current state of development

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1. Introduction

With the development of society, our lives are increasingly inseparable from computer network technology, since it has a powerful information processing ability, which can provide people with all kinds of convenience in their lives. Nowadays, with the arrival of the big data era, computer science and technology are being applied to various industries, including big data analysis, prediction, cloud computing, and so on. Through the application of computer science and technology, not only can the data processing efficiency be improved, but also big data analysis can be more accurate and scientific. This paper firstly describes the value of the application of computer science and technology in the context of big data, then analyzes the current situation of the application of computer science and technology, and finally discusses the strategy of the application of computer science and technology in the context of big numbers from several aspects. We hope that it will be helpful for related research.

2. Overview of computer science and technology

2.1. Definition and development history

A computer is a general-purpose electronic computing tool used to perform functions such as data processing,

information storage, and transmission. Computer science and technology is the study of the design, manufacture, operation, and maintenance, as well as the development and application of computer systems. Its main task is to enable computer systems to work according to human wishes and to process data according to human requirements. Computer science and technology have gone through three important phases, from the digital era to the network era to the big data era ^[1].

In the first stage, starting from the 1950s, human beings began to study computer technology. In this stage, people mainly focus on the development of computer hardware and the design of computer language. With the continuous development and improvement of computer hardware, people began to explore the application of computers in various fields.

In the second stage, in the 1960s, the world's first general-purpose computer was invented. The computers in this period already had basic computing capabilities and data storage functions, but their performance was still limited. With the continuous progress of computer technology, people began to explore the application of computers in data processing and information management.

In the third stage, in the 1980s, high-performance, multi-functional supercomputers appeared. These computers not only have higher computing speed and greater storage capacity but also have stronger data processing and information management capabilities. At this stage, computer science and technology have been widely used, including scientific computing, engineering design, information management, network communication, and other fields.

2.2. Related concepts and basic principles

Computer technology refers to computer science and technology, mainly including electronic computers and software, which belong to the category of science and technology. Computer science and technology involves the design, manufacture, installation, debugging, and maintenance of computer hardware and software, as well as database management, network management programming, and other disciplines and specialties. With the progress of computer technology, these related disciplines and specialties have been widely used on the Internet and play an important role in people's lives and work. Database management systems and various large-scale network management systems are typical representatives. These systems provide convenience for people and promote the continuous development of computer science and technology.

The basic principles of computer science and technology include computer hardware and software design principles, data processing and information management principles, and network communication principles. These principles are the basis for developing computer science and technology and the key to their wide application in various fields.

3. Concepts and characteristics of big data

3.1. Definition of big data

Big data is an emerging information processing technology, which can complete the collection, storage, processing, analysis, and mining of large amounts of data in a short period, covering rich content. Compared with data, big data has the following characteristics: huge capacity, which may reach the petabyte level; diverse data types which not only include text and images, but also cover a variety of formats such as video, audio, etc.; fast processing speed, which significantly improves the efficiency compared to traditional data processing; and high-

value big data that can provide all kinds of useful information products, such as geographic location, behavioral trajectory, and customer behavior. Through the processing and mining of big data, more valuable information can be provided to relevant personnel.

3.2. Characteristics and challenges of big data

Big data refers to massive data that exceeds traditional data, is stored in the form of data, and requires technical analysis to be used. Big data has the following characteristics. Firstly, it is large in scale. With the continuous development of information technology and Internet technology, the scale of data is getting bigger and bigger. Traditional data processing methods can no longer meet the needs of big data, so new data processing technologies and processes are needed.

Secondly, there are multiple types. Big data includes many types of data, such as text, images, video, audio, and so on, and the number is still increasing. These different types of data require different processing techniques and methods, increasing the difficulty of big data processing.

Thirdly, it is of high value. With the continuous development of big data technology, the use of big data technology to analyze data can provide people with more valuable information, which makes the value of data in society increasingly high. However, how to extract valuable information from massive data is also a challenge for big data processing.

Fourthly, speed. In the era of big data, people need to acquire, store, and process large amounts of data faster, and big data technology can meet this need, thus improving the efficiency of people's access to information. Nevertheless, this also puts higher demands on the real-time and efficiency of big data technology.

In addition to the above characteristics, big data also faces some challenges. First, big data processing requires high-performance computing and storage resources, which increases the cost of big data processing. Second, big data processing needs to address the issues of data security and privacy protection to prevent data leakage and misuse. Finally, big data processing needs to solve the problem of data quality and data consistency to ensure the accuracy and reliability of data.

4. The application of big data in computer science and technology

4.1. Application of big data in data analysis and mining

In the context of the big data era, the application of computer technology in data processing is undoubtedly the key to improving the efficiency of information mining and strengthening the utilization of data value. Big data technology has significant advantages in the analysis of massive data and the refining of information, which provides a solid foundation for the progress of computer science and technology.

In the process of mining big data, it is crucial to choose mining methods that match the characteristics of the data. Traditional data mining methods such as classification, clustering, association rule mining, anomaly detection, etc., are all effective in refining valuable information from huge amounts of data to provide data support for the decision-making process.

For massive data sets, the use of technologies such as distributed processing, parallel computing, and cloud computing significantly improves the efficiency of data processing and simplifies the processing of big data.

In data analysis, the comprehensive use of data mining, data warehousing, and multi-dimensional analysis technologies not only can efficiently extract information from massive data but also can properly store and manage

these data and conduct in-depth multi-angle analysis [2].

The comprehensive application of these technologies plays an important role in promoting the progress of computer science and technology. For example, the financial industry can use big data for risk control, fraud identification, and market trend prediction; the healthcare industry can leverage big data for disease trend prediction, new drug development, and personalized treatment plan design; and the retail industry can use big data analysis to predict sales trends, optimize inventory management and deeply understand customer behavior.

4.2. Application of big data in artificial intelligence and machine learning

With the continuous progress of computer science and technology, computer technology has been widely used in the field of intelligence. The development of artificial intelligence (AI) technology has been greatly promoted through the in-depth study of computer models and data.

The application of artificial intelligence technology in computer science and technology mainly covers three aspects: computer simulation technology, data mining technology, and intelligent systems. By exploring these three aspects, the performance of different systems can be examined, and the system performance problems can be revealed through data analysis, and the system can then be optimized.

In the field of big data, data resources play an important role. Firstly, big data provides a rich source of information for AI systems, which enables the systems to learn and master more knowledge and laws. Secondly, big data processing technology can improve the processing speed and efficiency of the system, enabling the system to make decisions and responses more quickly.

Machine learning is an important branch of artificial intelligence, which automatically builds models and makes predictions and classifications by learning from a large amount of data. Big data also plays an important role in machine learning. Firstly, big data provides rich training data for machine learning, which enables machine learning models to learn the laws and features of data more accurately. Secondly, big data processing technology can improve the efficiency and accuracy of machine learning, which makes the machine learning model can be better applied to the actual scene. For example, in the field of image recognition, big data can be used to train deep learning models to improve the accuracy and efficiency of image recognition. In the field of natural language processing, big data can be used to train language models to improve the accuracy and fluency of natural language processing. In the field of recommender systems, big data can be used to analyze the user's behavior and interest to provide users with more personalized recommendation services.

5. The development status of computer science and technology in the context of big data

At present, China is gradually moving into the era of big data, and computer science and technology in this context have been significantly developed. Now, China's computer science and technology have become an important part of people's daily lives, learning, and work. In the era of big data, computer science and technology continue to be updated and iterative, and are moving toward the direction of networking, informatization, intelligence, and so on.

5.1. Development of cloud computing technology

Cloud computing technology, as a bright star in the field of computer science in the era of big data, is leading a revolutionary change. It efficiently integrates computing resources, storage resources, and information resources into a unified virtual platform, which not only realizes the maximized sharing and utilization of resources, but also

gives the computing and storage capacity unparalleled flexibility and scalability, and perfectly matches the high standard requirements of big data processing. With the strong support of this technical architecture, processing technology can be deeply integrated with cloud computing, emitting unlimited application potential. A cloud computing platform is like a digital treasure trove with the following capabilities.

- (1) Powerful data processing capabilities: Like a Swiss army knife, the multi-functional platform can easily cope with the storage, retrieval, and analysis needs of massive data. For example, Alibaba’s cloud platform successfully processed more than 112 million orders during the 2019 “Double Eleven” shopping festival, with an hourly processing capacity of up to 540 million orders, demonstrating its excellent data processing strength.
- (2) Convenient data access and control: Users can easily access and control their personal data resources through this platform with just a click of the mouse. For example, Tencent Cloud’s cloud storage service provides users with an easy-to-use interface, making data management as simple as browsing the web. **Figure 1** shows how a cloud computing platform can efficiently integrate and manage data resources.

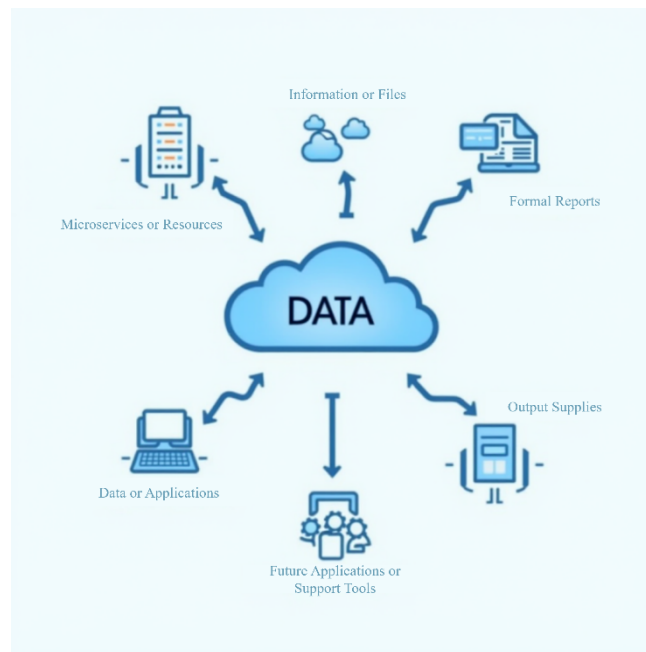


Figure 1. Schematic diagram of cloud computing platform

In the figure, we can see that data converges to the cloud computing platform from all directions, and after processing, it is then distributed to various application scenarios, realizing the seamless flow and efficient utilization of data.

In short, the platform not only greatly promotes smooth data sharing and teamwork, but also creates countless successful cases in various industries, such as finance, healthcare, education, etc., laying a solid foundation for the prosperous development of the big data era ^[3].

5.2. Breakthroughs in artificial intelligence technology

Driven by the wave of digitization, artificial intelligence technology has become a bright pearl in the field of computer science in the era of big data, which not only marks the new direction of scientific and technological

development but also an important breakthrough in the context of big data. With the rapid progress of big data technology, artificial intelligence has also made remarkable achievements. Deep learning, machine learning, and other advanced technologies have widely penetrated medical, financial, education, and other industries, creating significant social and economic benefits. Thanks to the richness of big data, AI can draw on the rich data resources and carry out accurate learning and identification, thus revealing the deep-seated laws behind the data. At the same time, the improvement of big data processing technology has also injected a strong impetus into the efficiency and accuracy of AI, enabling it to shine in real-world application scenarios such as autonomous driving and intelligent diagnosis. The following is a schematic diagram showing the application of AI in the medical field, which vividly demonstrates the perfect integration of big data and AI technology.



Figure 2. Application scenarios of artificial intelligence in medical diagnosis

6. Conclusion

In the context of the big data era, the field of computer science and technology is showing unprecedented vitality and potential. Advances in key technologies such as data parsing, artificial intelligence, and network security have not only led to the transformation of computer science and technology but also brought revolutionary development opportunities to various industries. With the continuous breakthroughs in technology, the efficiency of data processing and analysis has been significantly improved, and the level of intelligence, automation, and visualization has progressed comprehensively. In the face of the future, we will continue to strengthen technological research and innovation, and deeply integrate computer science and big data technology, while paying attention to data security and privacy protection to ensure healthy and sustainable development. In the practice of scientific and technological innovation and application, we will endeavor to build a more intelligent, efficient, and secure data processing and application system to better serve society.

Disclosure statement

The author declares no conflict of interest.

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