

# Analysis of Computer Information Processing Problems Based on Big Data

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**Abstract:** In the era of big data, computer information processing technology faces many challenges. To address these issues, it is necessary to seek practical and effective solutions. Optimizing algorithms and improving data structures are key to improving data processing performance. Utilize cloud computing and distributed storage technology to achieve fast data storage and access, and improve processing efficiency. To address the diversity and dynamism of data, it is necessary to strengthen data preprocessing and feature extraction. Improve data quality through preprocessing such as data cleaning and conversion; Using advanced feature extraction techniques to extract valuable information from massive data. Data security and privacy protection are crucial. Strengthen talent cultivation and team building, cultivate professional data processing talents, establish efficient collaboration mechanisms, jointly address challenges, and promote the innovative application of big data technology. Solving computer information processing problems under big data requires starting from multiple aspects such as algorithm optimization, data preprocessing, security and privacy protection, and talent cultivation. By implementing comprehensive policies, we aim to improve processing efficiency and security, and support the development of the big data era.

## 1. Introduction

In the era of informatization, big data has become a key driving force for social development, widely penetrating into various fields of society. Whether it is business decision-making, medical research, government governance, or educational innovation, it cannot do without the support of big data[1]. With the rapid growth of data volume, computer information processing technology is facing unprecedented challenges.

The explosive growth of big data has brought a heavy burden to computer information processing systems[2]. Traditional information processing systems often struggle to cope with such a huge amount of data, leading to slower processing speeds and even system crashes. This overloaded working state not only affects the quality and efficiency of information processing, but may also lead to the loss or delay of important information, thereby affecting the scientificity and accuracy of decision-making [3].

The intricacies and variety of big data demand higher standards for computer information processing technology [4]. Different data types necessitate distinct processing methods, and efficiently integrating, analyzing, and utilizing these data is a pressing concern. Big data frequently contains noise and invalid information, making extracting valuable insights a challenge for computer information processing technology. To address this, we must continually enhance the level of computer information processing technology. Strengthening technological research and development, and fostering innovation in this field is crucial. For instance, introducing advanced algorithms and models can boost information processing efficiency and accuracy. Developing more efficient data storage and transmission technologies can alleviate system load pressure. Additionally, talent cultivation and team building are essential. Cultivating a cadre of versatile talents proficient in both technology and business can provide robust support for the advancement of computer information processing technology. Furthermore, data security and privacy protection are paramount. Ensuring data security and privacy, and preventing data leakage and misuse during big data processing, is imperative. Establishing a robust data security management system and technical safeguards is vital to ensure the lawful and compliant utilization of big data [5].

The problem of computer information processing based on big data is a complex and urgent issue. We need to start from multiple aspects and continuously improve the level of computer information processing technology to cope with the challenges and opportunities of the big data era[6].

## **2. Overview of Big Data and Computer Information Processing**

### **2.1. Definition and Characteristics of Big Data**

Big data, as an important concept in today's information age, is leading the trend of social development with its unique definition and characteristics[7]. Big data refers to a large and complex collection of data that traditional data processing applications find difficult to handle. These datasets not only surpass the processing capabilities of traditional databases in terms of scale, but also exhibit unprecedented characteristics in terms of data type, flow speed, and value density [8].

Big data has a variety of data types. Traditional data often exists in a structured form, while big data encompasses various types of data, including structured, semi-structured, and unstructured data. This diversity enables big data to more comprehensively reflect the complexity of the real world and provide richer sources of information for decision-making. Big data has the characteristic of fast data flow. In the information age, the generation and updating speed of data is extremely fast, and big data systems need to be able to capture, process, and analyze this data in real time to meet the rapidly changing market and social demands. The value density of big data is relatively low. This means that in a vast dataset, only a small portion of truly valuable information may be present. How to extract valuable information from massive data has become the key to big data processing and analysis. The massive scale of big data is its most significant feature. This scale is not only reflected in the quantity of data, but also in the source and coverage of the data. Big data can come from various channels, including the Internet, the Internet of Things, sensors, etc., covering information in various fields and industries [9].

In the current context of diversified development, the value of big data is irreplaceable. Through in-depth exploration and effective application of big data, we can better understand social phenomena, grasp market trends, optimize resource allocation, and thus promote the progress and development of the entire society[10]. We should actively embrace the era of big data, fully tap into its potential, and contribute to the prosperity and development of society.

### **2.2. Concept and Function of Computer Information Processing**

Computer information processing refers to the process of using computer technology to collect, store, transmit, process, and output various types of information. In today's information society, computer information processing has become an important cornerstone of modern society, with its functions and applications being extensive and far-reaching.

The concept of computer information processing encompasses the full lifecycle management of information. Starting from the acquisition of information, whether it is text, images, audio or video, computers can efficiently collect and organize them. Subsequently, the information is stored on the computer's hard drive or other storage devices, ensuring the persistence and fast access of the data. The transmission of information depends on computer network technology. Both the LAN and the Internet can realize the rapid transmission and sharing of information. The core of computer information processing lies in the processing and output of information, which is deeply analyzed through algorithms and models to extract valuable information and present it to users in a visual way.

In terms of functionality, computer information processing has demonstrated powerful capabilities. It can not only process massive amounts of data, but also achieve precise analysis and prediction of data. In the business field, by analyzing consumer behavior data, enterprises can more accurately formulate marketing strategies; In the medical field, mining medical record data can help doctors discover the patterns and trends of diseases, and improve the level of diagnosis and treatment. Computer information processing also has highly automated and intelligent

characteristics, which can reduce manual intervention, improve work efficiency, and reduce error rates.

As one of the core technologies of the information society, computer information processing has not only changed people's way of life, but also promoted social progress. With the continuous development of technology, computer information processing will play a greater role in more fields, creating a better future for humanity.

### 3. Shortcomings of computer information processing technology in the context of the big data era

In the context of the big data era, our production and life have indeed experienced unprecedented efficiency and convenience. However, this transformation has also brought unprecedented challenges, especially higher requirements for computer information processing technology. Although the current Internet and information technology are changing with each passing day, we still face many shortcomings in the field of computer information processing, the most prominent of which is the problem of complex processing procedures and low efficiency.

The massive scale and complexity of big data pose enormous challenges to computer information processing technology. Traditional data processing methods often struggle to cope with such massive amounts of data, especially in the storage, transmission, and analysis stages. This not only increases the complexity of the processing program, but also leads to low processing efficiency. When processing large-scale data, computers often require a large amount of time and computing resources, which not only affects the speed of data processing, but may also affect the accuracy of processing results.

The diversity and dynamism of big data also pose significant challenges to computer information processing technology. The diversity of data types means that we need to use different processing methods and algorithms to cope, which undoubtedly increases the complexity of processing programs. The dynamic changes in data also require information processing systems to be able to update and adjust in real-time, which puts higher demands on the flexibility and real-time performance of the system. However, existing computer information processing technologies still have certain shortcomings in these areas, making it difficult to fully meet the needs of big data processing.

Table 1 Challenges Faced by Big Data in Computer Information Processing Technology

| In terms of challenges                                    | Challenge content   | Impact and consequences                                  | Insufficient existing technology                             |
|---|---|--|--|
| Scale and complexity<br>Diversity and dynamism            | Difficulty in dealing with massive amounts of data            | Complex and inefficient processing programs              | Traditional data processing methods are not applicable       |
|   | Difficulties in storage, transmission, and analysis processes | Consuming a lot of time and computing resources          | Speed and accuracy are affected                              |
| Security and privacy protection<br>In terms of challenges | Diversified data types  | Different processing methods and algorithms are required | Increase processing complexity                               |
|   | Dynamic changes in data                                       | Require real-time system updates and adjustments         | High requirements for flexibility and real-time performance  |
| Scale and complexity                                      | Data security and privacy risks                               | Prevent data leakage and abuse                           | There are technical vulnerabilities and deficiencies         |
|   | Urgent problem to be solved                                   | Big data applications face risks                         | Data security and privacy protection need to be strengthened |

The security and privacy protection of big data pose significant challenges for computer

information processing technology. Ensuring data security and privacy, while preventing leakage and abuse, remains a pressing issue. Existing technologies still exhibit vulnerabilities in this regard, introducing risks to big data applications. Despite advancements in computer information processing in the big data era, issues persist with complex and inefficient processing programs. To overcome these, technological research and innovation are crucial to enhance performance and efficiency, fulfilling big data processing requirements. Simultaneously, research on data security and privacy protection is imperative to effectively safeguard big data security and privacy. Table 1 clearly presents the challenges faced by big data in computer information processing technology.

#### **4. Solutions to computer information processing problems under big data**

In the era of big data, computer information processing technology is facing many challenges. To address these issues, we need to seek practical and effective solutions to improve the quality and efficiency of information processing.

We can adopt distributed computing technology to address the massive scale and complexity of big data. By dividing big data into multiple small blocks and assigning them to different computer nodes for parallel processing, the speed and efficiency of data processing can be significantly improved. This distributed computing architecture not only fully utilizes computing resources, but also effectively responds to dynamic changes in data, achieving real-time processing and response.

To address the challenges posed by the diversity and dynamism of big data, we need to strengthen research on data preprocessing and feature extraction techniques. By performing preprocessing operations such as data cleaning, transformation, and standardization, noise and outliers in the data can be eliminated, thereby improving the quality of the data. By utilizing feature extraction techniques, we can extract valuable feature information from raw data, providing strong support for subsequent data analysis and mining.

In order to ensure the security and privacy of big data, we need to strengthen the application of data encryption and access control technologies. By adopting advanced encryption algorithms and protocols, the security of data during storage and transmission can be ensured. Establishing a comprehensive access control mechanism and implementing strict permission management and auditing for data access and usage can effectively prevent data leakage and abuse.

We also need to focus on talent cultivation and team building. Big data processing and analysis require professional knowledge and skills. We need to strengthen the cultivation and introduction of relevant talents, establish a high-quality and professional computer information processing team, strengthen cooperation and communication between teams, form a joint force, and jointly address the challenges in big data processing.

We also need to focus on the formulation and implementation of policies and regulations. The government should introduce relevant policies to encourage and guide enterprises to strengthen the research and application of computer information processing technology, promote the healthy development of the big data industry, strengthen supervision and regulation of big data applications, ensure the legality and compliance of data, and prevent data abuse and infringement of personal privacy.

Solving computer information processing problems under big data requires multiple efforts and cooperation. By adopting distributed computing technology, strengthening research on data preprocessing and feature extraction technology, enhancing the application of data encryption and access control technology, emphasizing talent cultivation and team building, and formulating and implementing relevant policies and regulations, we can effectively address the challenges in big data processing and promote the development and application of computer information processing technology. Table 2 clearly shows the solutions to computer information processing problems under big data.

Table 2 Solutions to Computer Information Processing Problems under Big Data

| Response measures                                    | Concrete content  | Anticipate result   |
|--|---|---|
| Distributed computing technology                     | Divide big data into small blocks for parallel processing       | Improve data processing speed and efficiency  |
| Data preprocessing and feature extraction            | Fully utilize computing resources                               | Respond to dynamic data changes and achieve real-time processing                            |
| Data encryption and access control                   | Data cleaning, transformation, and standardization              | Improve data quality, eliminate noise and outliers  |
| Talent cultivation and team building                 | Feature extraction technology                                   | Extracting valuable feature information to support subsequent analysis                      |
| Policy and regulatory formulation and implementation | Adopting advanced encryption algorithms and protocols           | Ensure the security of data during storage and transmission                                 |
| Response measures                                    | Establish access control mechanism                              | Strict permission management and auditing to prevent data leakage and abuse                 |
| Distributed computing technology                     | Strengthen the cultivation and introduction of relevant talents | Establish a high-quality and professional team  |
| Data preprocessing and feature extraction            | Strengthen team collaboration and communication                 | Form a joint force to tackle challenges together  |
| Data encryption and access control                   | The government has introduced relevant policies                 | Encourage and guide technology research and application, and promote industrial development |
|  | Strengthen supervision and regulation                           | Ensure data legality and compliance, prevent data abuse and privacy infringement            |

## 5. Conclusions

In the age of big data, computer information processing encounters both challenges and opportunities. To meet these challenges and capitalize on the potential of big data, we must seek practical solutions. Given the vast scale and intricacies of big data, distributed storage and cloud computing are viable technologies. By dispersing data across multiple nodes and harnessing the scalability of cloud computing, we can significantly enhance data processing speed and efficiency. This approach not only manages the rapid growth of data but also ensures its security and reliability. To address the diversity and dynamism of big data, we must intensify research on data cleaning and preprocessing techniques. Effective data cleaning and transformation eliminate noise and outliers, improving data quality. Additionally, advanced data mining and machine learning techniques extract valuable insights from vast datasets, enhancing decision-making accuracy. To safeguard big data security and privacy, we must strengthen the application of data encryption and access control technologies. Big data processing and analysis require specialized knowledge and skills, necessitating the cultivation and recruitment of relevant talents. Establishing a high-quality, specialized computer information processing team is crucial. Moreover, government and enterprises must collaborate to jointly foster the growth of the big data industry.

Solving computer information processing problems under big data requires multiple efforts and cooperation. This will help us better understand social phenomena, grasp market trends, optimize resource allocation, and contribute to the prosperity and development of society.

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