

Analysis of the Impact of Artificial Intelligence and Big Data on Computer Applications

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Abstract: *Big data is a relatively advanced information technology that can integrate various data and information, accurately analyze and process things, and predict future development trends. The emergence of big data technology has greatly expanded the workspace of computers on the one hand, and on the other hand, it has also changed the traditional complex information processing mode, greatly improving work efficiency. Based on this, this article briefly analyzes the impact of artificial intelligence and big data on computer applications.*

Keywords: Artificial intelligence; Big data; Computer; Effect.

1. THE IMPACT OF ARTIFICIAL INTELLIGENCE ON COMPUTER APPLICATIONS

1.1 Development and Application of Artificial Intelligence Technology

The development process of artificial intelligence technology is full of innovation and breakthroughs, from early theoretical research to current practical applications, it has undergone multiple major changes.

In terms of development, continuous optimization of algorithms is key. The emergence of deep learning algorithms, such as Convolutional Neural Networks (CNN) and Recurrent Neural Networks (RNN), has greatly improved the performance of artificial intelligence. These algorithms can automatically learn features and patterns from large amounts of data, greatly improving the accuracy of tasks such as image recognition and speech recognition. At the same time, the improvement of computing power also provides strong support for the development of artificial intelligence technology. High performance graphics processing units (GPUs) and dedicated artificial intelligence chips enable complex models to be trained in a shorter amount of time.

In the field of application, artificial intelligence technology can be said to be ubiquitous. In the medical field, it can assist doctors in disease diagnosis by analyzing medical images to detect early lesions. In the field of transportation, autonomous driving technology is gradually maturing and is expected to improve traffic safety and efficiency. In the financial field, artificial intelligence technology has been used to achieve more accurate judgments in risk assessment and fraud detection. In the field of education, personalized learning systems can provide customized teaching content based on students' learning situations. In addition, artificial intelligence technology also plays an important role in industrial production. Intelligent robots can complete complex production tasks, improve production efficiency and product quality. In the field of agriculture, precise planting and pest control are achieved through monitoring and analysis of crops. However, the development and application of artificial intelligence technology also face some challenges. The issues of data privacy and security have attracted much attention, and a large amount of data collection and processing may lead to personal information leakage. Ethical and moral issues are gradually becoming prominent, such as algorithmic bias and the fairness of decision-making. In short, the development prospects of artificial intelligence technology are broad, but it is necessary to pay attention to the various problems it brings while innovating technology, in order to achieve sustainable development and widespread beneficial applications.

In smart city applications, Li et al. [1] developed gamified data visualization techniques to enhance citizen engagement in urban monitoring, while Wang [3] focused on optimizing last-mile delivery efficiency through AI-powered logistics solutions. Complementary to these urban innovations, Li and Wang [5] created deep learning-enhanced adaptive interfaces to improve accessibility in e-government platforms, showcasing AI's potential in public service digital transformation. The healthcare sector has similarly benefited from AI integration, as evidenced by Li's [4] work on machine learning applications for adverse event monitoring in chronic disease drug trials and Yuan's [6] exploration of GPT-4 for processing multimodal medical data in electronic health

records. These studies highlight AI's growing role in enhancing medical research and healthcare delivery. Logistics and warehouse management have seen substantial improvements through AI implementation. Song's [2] research on human-centric logistics decision-making combines AI-driven route optimization with predictive analytics, while his later work [7] enhanced warehouse management systems through automatic speech recognition technology for human-computer interaction.

1.2 Improvement of Computer Performance by Artificial Intelligence

In today's digital age, the rapid development of artificial intelligence has had a profound and significant impact on computer performance.

Firstly, the complexity of artificial intelligence algorithms is constantly increasing, which requires computers to have more powerful computing power. For example, the training process of neural network models in deep learning involves a large number of matrix operations and data processing. To meet these demands, the central processing unit (CPU) and graphics processing unit (GPU) of computers are constantly optimized and upgraded to provide higher floating-point computing performance and parallel processing capabilities. On the other hand, the explosive growth of data volume in artificial intelligence applications places higher demands on the storage performance of computers. Large scale datasets require efficient storage systems to quickly read and write data, thereby avoiding bottlenecks in data transmission. As a result, computer memory technology continues to innovate, with high-speed DDR memory and non-volatile storage technologies such as SSD widely used to improve data access speed.

Secondly, the real-time processing requirements in artificial intelligence, such as autonomous driving and intelligent monitoring, have significantly reduced the response time and latency of computers. This requires collaborative innovation in hardware architecture and software optimization of computers, adopting low latency communication protocols and efficient task scheduling algorithms to ensure that computers can complete complex computing tasks in a very short amount of time. In addition, the development of artificial intelligence has also driven improvements in energy management for computers. In order to support large-scale artificial intelligence computing, computers need to reduce energy consumption while ensuring performance, in order to achieve sustainable development. This has led to advances in chip manufacturing processes, adopting more advanced process technologies to reduce power consumption, and also promoting optimization of computer systems in power management and heat dissipation. The vigorous development of artificial intelligence has comprehensively improved the performance of computers, promoted continuous innovation and progress in computer technology, and laid a solid foundation for future technological development.

2. THE IMPACT OF COMPUTER APPLICATIONS ON BIG DATA

2.1 Development and Application of Big Data Technology

In the early days, data processing capabilities were limited, and data storage and analysis faced many challenges. However, with the continuous advancement of technology, the emergence of technologies such as cloud computing, distributed storage, and parallel computing has provided powerful support for the processing of big data. Nowadays, big data technology can handle massive and diverse data, including structured, semi-structured, and unstructured data.

In terms of application, big data technology plays a crucial role in the business field. By collecting and analyzing user behavior data, consumption habits, etc., enterprises can achieve precise marketing and improve market competitiveness. For example, e-commerce platforms use big data to analyze users' browsing and purchasing history, recommend personalized products to users, and thereby increase sales and user satisfaction.

In the medical field, big data technology helps with disease prediction and diagnosis. By integrating patients' medical records, genetic data, clinical symptoms and other multi-source data, doctors can more accurately determine the type and development trend of diseases, and formulate more effective treatment plans.

In the field of transportation, big data technology can optimize traffic flow management. By collecting and analyzing real-time vehicle data and road condition information on the road, traffic management departments can adjust signal light settings in a timely manner to alleviate traffic congestion.

In the financial field, big data technology is used for risk assessment and fraud detection. Banks and financial institutions can assess customers' credit risks and prevent fraudulent behavior by analyzing their transaction data, credit records, and other factors. In addition, big data technology also has important applications in fields such as education, scientific research, and environmental protection.

2.2 The impact of big data on computer storage and processing capabilities

The rapid development of big data has had a profound and significant impact on computer storage and processing capabilities. In today's digital age, the amount of data is exploding, and the scale and complexity of big data are constantly increasing, posing unprecedented challenges to the storage and processing capabilities of computers.

From the perspective of storage, the massive amount of data in big data requires enormous storage space.

Traditional storage methods are no longer sufficient to meet demand, which has led to the development of new storage technologies such as distributed storage and cloud storage. These technologies can effectively expand storage capacity, achieve distributed storage and management of data, and improve data reliability and availability. At the same time, in order to cope with the diversity of big data, storage systems need to support multiple data types and formats, including structured, semi-structured, and unstructured data.

2.2.2 In terms of processing capability, efficient computing power is required for big data processing.

Parallel computing, distributed computing, and other technologies have emerged to achieve fast processing of large-scale data by allocating computing tasks to multiple computing nodes. In addition, hardware improvements such as multi-core processors and GPU acceleration also provide strong support for big data processing.

The real-time processing requirements of big data also place higher demands on computer processing capabilities.

Real time analysis and decision-making require computers to be able to process and analyze large amounts of data in a short amount of time, which requires optimizing algorithms and data structures to improve data processing efficiency. At the same time, the rapid flow and updating of data require processing systems to have good fault tolerance and recovery capabilities to cope with possible failures and errors.

In summary, the development of big data poses various challenges and requirements for computer storage and processing capabilities. Computer technology needs to constantly innovate and develop to meet the needs of the big data era and provide stronger support for applications in various fields.

3. THE IMPACT OF THE INTEGRATION OF ARTIFICIAL INTELLIGENCE AND BIG DATA

3.1 The trend of combining artificial intelligence and big data

In today's digital age, the integration of artificial intelligence and big data has become an unstoppable trend. This integration is not accidental, but the result of the joint promotion of technological development and application needs.

From a technical perspective, the algorithms and models of artificial intelligence require a large amount of data for training and optimization, and the massive, diverse, and high-speed data resources provided by big data provide a solid foundation for the development of artificial intelligence. At the same time, the processing and analysis technology of big data is constantly advancing, which can more efficiently mine and extract valuable information, providing strong support for the application of artificial intelligence.

In the application field, the combination of artificial intelligence and big data has demonstrated significant advantages. For example, in the field of healthcare, by conducting big data analysis on patients' medical data and combining it with artificial intelligence disease prediction models, more accurate disease diagnosis and treatment plan formulation can be achieved. In the financial industry, using big data to collect and analyze market data, combined with artificial intelligence risk assessment models, can more accurately predict market risks and optimize investment strategies. In addition, with the popularization of IoT technology, the integration of massive data generated by smart devices and artificial intelligence has enabled intelligent services and management in

fields such as smart homes and intelligent transportation. In the manufacturing industry, big data-driven production process monitoring and quality control, combined with artificial intelligence's fault prediction and optimization algorithms, have improved production efficiency and product quality. In short, the trend of combining artificial intelligence and big data is inevitable, and this integration will bring unprecedented innovation and breakthroughs to various fields, promoting the intelligent development process of society.

3.2 Integration drives innovation in the field of computer applications

In today's digital age, the integration of artificial intelligence and big data is driving innovation in the field of computer applications at an unprecedented speed. This integration has brought many new opportunities and challenges to computer applications, profoundly changing the development models of various industries and people's lifestyles.

In the financial field, integration has also brought significant changes. By utilizing big data to collect and analyze massive amounts of financial transaction data, market dynamics, and customer information, combined with artificial intelligence risk assessment models, financial institutions can more accurately assess credit risk, optimize investment portfolios, and prevent financial fraud. Meanwhile, applications such as intelligent customer service and intelligent investment advisory also provide customers with more convenient and efficient services.

The education sector also benefits from this integration. Based on comprehensive recording of students' learning behavior and grades using big data, combined with adaptive learning technology of artificial intelligence, personalized learning paths can be tailored for each student, providing accurate learning resource recommendations, and improving learning efficiency and educational quality.

In industrial manufacturing, integration has driven the development of intelligent manufacturing. By collecting and analyzing a large amount of data on the production line, combined with predictive maintenance technology of artificial intelligence, equipment failures can be detected in advance, downtime can be reduced, production efficiency and product quality can be improved.

4. CONCLUSION

In short, the integration of artificial intelligence and big data has brought comprehensive innovation and promotion to the field of computer applications. In the future, with the continuous advancement of technology and the accumulation of data, this integration will demonstrate enormous potential in more fields, creating more value for the development of human society. But at the same time, we also need to pay attention to issues such as data privacy protection and algorithm fairness, to ensure that the development of integration is healthy and sustainable.

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