Journal of Electronic Research and Application, 2025, Volume 9, Issue 2
http://ojs.bbwpublisher.com/index.php/JERA
ISSN Online: 2208-3510
ISSN Print: 2208-3502

Application Strategies of Artificial Intelligence and Big Data Technology in Computer Monitoring and Control

Yumin Yuan, Xiyuan Li*

Chongqing University of Science and Technology, Chongqing 401331, China.

Corresponding author: Xiyuan Li, 3171005983@qq.com

Abstract: This article focuses on the current computer monitoring and control as the research direction, studying the application strategies of artificial intelligence and big data technology in this field. It includes an introduction to artificial intelligence and big data technology, the application strategies of artificial intelligence and big data technology in computer hardware, software, and network monitoring, as well as the application strategies of artificial intelligence and big data technology in computer process, access, and network control. This analysis aims to serve as a reference for the application of artificial intelligence and big data technology in computer monitoring and control, ultimately enhancing the security of computer systems.

Keywords: Computer monitoring and control; Artificial intelligence technology; Big data technology; Hardware and software; Network security

Online publication: March 28, 2025

1. Introduction to artificial intelligence and big data technology

With the comprehensive application and popularization of modern computer network technology, computer monitoring and control have become crucial to ensuring the security of network information. In specific computer monitoring and control tasks, artificial intelligence (AI) and big data technology exhibit significant advantages [1]. Based on this, researchers first need to fully understand AI and big data technology. Then, combining current computer monitoring and control requirements, they can explore the application of AI and big data technology to fully leverage their advantages.

Artificial intelligence (AI) technology is an important branch of modern computer science. It is a cutting-edge technology with comprehensive characteristics and its basic application goal is to equip computer systems with human-like wisdom and capabilities, including perception, learning, reasoning, decision-making, and task execution abilities. Currently, key components of AI technology include machine learning, deep learning,

natural language processing, computer vision, and knowledge graph techniques [2]. With advantages such as high efficiency and intelligence, this technology has been widely applied in many current fields.

Meanwhile, big data technology is an emerging technology in the modern computer information field. Its basic application purpose is to quickly acquire valuable information from massive amounts of diverse data. Presently, the main components of big data technology consist of data collection, data processing, data storage, data analysis, and data visualization techniques [3]. Thanks to its high efficiency, precision, and visualization capabilities, big data technology has been extensively used in various current domains and has exhibited significant advantages supported by computer technology.

In the current field of computer monitoring and control, the integrated advantages of artificial intelligence and big data technology are mainly manifested in the following aspects. Firstly, the effective integration of the two can further enhance the computer's data processing capabilities, enabling timely and effective collection, integration, storage, management, and analysis of massive data in monitoring and control [4]. Secondly, effective integration can further improve the computer's data analysis and decision-making abilities, providing support for real-time data analysis and intelligent decision-making in monitoring and control. Thirdly, effective integration can enhance the computer's fault diagnosis and recovery capabilities, enabling timely and reasonable fault diagnosis and recovery during monitoring and control.

2. Main application strategies of artificial intelligence and big data technology in computer monitoring

For current computer monitoring, there are three main application directions of artificial intelligence and big data technology: hardware monitoring, software monitoring, and network monitoring. The following is an analysis of the main application strategies of artificial intelligence and big data technology in this monitoring work.

2.1. Application of artificial intelligence and big data technology in hardware monitoring

Hardware monitoring is a key aspect of computer security monitoring. Through reasonable monitoring of computer hardware such as power supply, hard disk, memory, and CPU, corresponding hardware failures or abnormalities can be detected in a timely manner and handled promptly to prevent hardware damage from adversely affecting the stable and safe operation of the computer. During specific monitoring, artificial intelligence technology is mainly used for real-time monitoring and analysis of various hardware states, and making scientific predictions about their subsequent operation [5]. For example, for hardware abnormalities obtained via sensors, technicians can use machine learning technology to establish a corresponding hardware failure prediction model, train and analyze its state data, and make timely and accurate predictions about upcoming failures. Big data technology is mainly used to quickly detect, analyze, and determine corresponding hardware failures, ensuring they are handled promptly to significantly reduce downtime due to failures. For instance, in hardware monitoring, technicians can use big data mining technology to promptly identify abnormal hardware operating parameters and analyze the causes of failures, subsequent development trends, and impact levels with the help of big data analysis technology [6]. This allows for timely detection and handling of hardware failures or abnormalities during computer operation, preventing further development of hardware failures that may lead to downtime and ensuring the safe and stable operation of the computer.

2.2. Application of artificial intelligence and big data technology in software monitoring

For current computer security monitoring, software monitoring is also an important aspect. In this aspect, artificial intelligence and big data technology can be applied in the following areas. The first is computer software performance monitoring and optimization. In this process, technicians can use big data technology to collect and analyze various performance index parameters during the actual operation of the software system to detect abnormal data in a timely manner.

For abnormal data, clustering algorithms in machine learning technology can be used to perform cluster analysis on similar events to quickly determine the type of software problem. The second is computer software fault diagnosis and repair. In this process, technicians can use big data technology to collect real-time data such as alarms and logs generated during software operation for analysis and learning by relevant algorithm models under artificial intelligence technology. This allows for timely detection and determination of data that deviates significantly from normal data, enabling rapid diagnosis of computer software faults.

For diagnosed faults, technicians can quickly develop reasonable repair plans by combining artificial intelligence and big data technology to achieve timely and effective repair of software problems [7]. The third is computer software security monitoring and protection. In this process, technicians can use big data technology to collect real-time security information, such as operating data and code information in the computer software system. With the support of machine learning technology, based on the characteristics of known viruses or vulnerabilities, they can analyze whether new operating data and code segments are consistent or similar to them, achieving timely and effective monitoring of software security. This allows for effective identification and prevention of various software viruses and intrusion detections.

2.3. Application of artificial intelligence and big data technology in network monitoring

In computer security monitoring, reasonable network monitoring is crucial. Based on this, technicians need to utilize current advanced artificial intelligence and big data technology to conduct real-time and effective monitoring of computer networks. For current computer network security monitoring, artificial intelligence and big data technology are primarily implemented through corresponding support software. The first is network traffic monitoring, including information such as its source, port, protocol, and destination. During specific monitoring, tools like Tcpdump and Wireshark can be used as primary support software. With the help of these tools, malicious and abnormal network traffic can be detected in a timely manner.

The second is network protocol monitoring, including protocol function, structure, and security. During monitoring, WinDump and the TCP/IP toolkit can serve as the main support software. With these tools, protocol vulnerabilities, security risks, and specific protocol attack behaviors in the network can be judged promptly. Finally, there is network attack monitoring, which includes various computer network and system attack behaviors. During specific monitoring, Suricata and Snort can be used as the main support software. With the help of these tools, various network attack behaviors can be detected and intercepted in a timely manner to prevent illegal attacks on the computer network.

3. Main application strategies of artificial intelligence and big data technology in computer control

From the perspective of current computer control work, there are also three main application directions of artificial intelligence and big data technology: process control, access control, and network control. During specific control

operations, technicians need to combine actual situations and reasonably introduce and apply artificial intelligence and big data technology to ensure computer control effectiveness and enhance its security. The following are the main application strategies of artificial intelligence and big data technology in computer control.

3.1. Application of artificial intelligence and big data technology in process control

In the process of computer security control based on artificial intelligence and big data technology, process control is the primary application direction of these technologies. Process control refers to managing programs that are in the running stage in the computer system to ensure the security and stability of the entire computer system. Currently, state monitoring, resource management, and priority scheduling are the main components of computer process control. In the specific process of process control, Process Explorer and Process Monitor are the primary monitoring software supported by artificial intelligence and big data technology. With the help of these monitoring software, various program process states running in the computer system can be monitored and controlled in real-time, including monitoring their running time, memory usage, and CPU occupancy, as well as controlling the suspension and termination of processes.

During this period, the main application strategy of artificial intelligence and big data technology is to collect, analyze, and process massive amounts of computer process data to achieve timely and effective prediction, prevention, and control of system failures. For example, machine learning algorithms can be used to train historical process data of various programs in the computer and establish a corresponding failure prediction model based on this. Then, based on big data technology, various process state data can be collected and acquired in real-time. With the support of the established failure prediction model, timely and accurate predictions can be made about upcoming failures during program operation, and effective measures can be taken to repair and maintain abnormal programs. This allows reasonable control of various program processes in the computer, effectively reducing the failure rate of the computer system caused by program failures, making the overall computer system operation safer and reliable.

3.2. Application of artificial intelligence and big data technology in access control

Access control is also a major application direction of artificial intelligence and big data technology in the field of computer security control. Currently, the main goal of computer access control is to manage the resources accessed by various processes or users within the computer system, restrict access to critical resources and sensitive data, and avoid unauthorized process or user access. This ensures the secure operation of the computer system. There are two types of computer access control technologies based on artificial intelligence and big data technology.

The first is identity verification technology, including facial recognition, fingerprint recognition, username and password recognition, etc. In this technology, big data technology can provide support for multi-source data collection (including basic user information, behavior data, environmental data, etc.), data integration and preprocessing, data analysis, and feature extraction. At the same time, with the help of machine learning algorithms, deep learning algorithms, artificial intelligence model training, and optimization in artificial intelligence technology, the accuracy of identity verification can be further improved, providing support for computer access control [8].

The second is access control technology based on user permissions, including different levels of permissions such as reading, writing, modifying, and executing network information by users. When applied specifically, intelligent technologies such as rule engines, machine learning, and deep learning can achieve reasonable control

over simple rules, permission grants, and resource access to prevent unauthorized users from accessing important data or sensitive information. The rational application of big data technologies such as data collection, data integration, data cleaning, and preprocessing can provide support and assistance to existing artificial intelligence technologies, improving the efficiency and accuracy of their analysis and control to achieve good access control effects.

3.3. Application of artificial intelligence and big data technology in network control

For modern computer security control, network control is one of the most critical control elements. Its basic goal is to monitor and control computer networks to maintain their safe and stable operation. Based on this, technicians should fully recognize the importance of network control and reasonably introduce artificial intelligence and big data technologies to provide more advanced technical support for this work [9]. In terms of current network control, the main application methods of artificial intelligence and big data technologies are to analyze and process massive network data in a reasonable way to achieve prediction and prevention of various network security issues. In this process, technicians can use machine learning technology to train historical network data, build a computer network attack prediction model based on this, and use this model to conduct real-time monitoring of all network traffic data to achieve accurate prediction of various network attacks [10]. Then, based on the prediction results and supported by artificial intelligence and big data technologies, in-depth research on prevention and response measures can be conducted to timely develop reasonable prevention and control plans so that computer network attacks can be effectively controlled.

4. Conclusion

In summary, artificial intelligence and big data technologies are key technologies in the modern network information age. These technologies not only provide strong support for the intelligent, efficient, and mass data operation of computer information systems but are also key technologies to ensure computer operation safety. Based on this, researchers and technicians need to strengthen related technology research, combine the current actual development of computers and their future development trends, reasonably introduce and apply artificial intelligence and big data technologies to give full play to their technical advantages, to ensure the safety of computer hardware, software, and its network environment and prevent unnecessary risks. This provides technical support for the safe and stable operation of computers.

Disclosure statement

The authors declare no conflict of interest.

References

[1] Xue L, Xin T, 2024, Application of Big Data and Intelligent Control Technology in Computer Network Systems. Integrated Circuit Applications, 41(4): 214–215.

[2] Yang Y, 2024, Research on Computer Network Security Defense System Based on Artificial Intelligence Technology. Cyberspace Security, 15(4): 306–309.

[3] Wu Z, Yu Y, Liu S, 2024, Application of Condition Monitoring and Auxiliary Control System in Smart Substation.

Information Technology, 2024(1): 170–175 + 188.

[4] Yao Y, 2024, Computer Network Security Risks and Control Strategies in the Era of Big Data. China Public Security, 2024(1): 151–153.

[5] Wang L, 2024, Application of Big Data and Intelligent Control Technology in Computer Network Information Security Systems. Integrated Circuit Applications, 41(4): 292–293.

[6] Cong H, Wang H, Tao S, et al., 2023, Analysis of Computer Network Security and Risk Control Strategies. Integrated Circuit Applications, 40(10): 284–285.

[7] Yin K, 2022, Research on Computer Network Security Risk Control in the Context of Artificial Intelligence. Telecommunications Power Technology, 39(21): 177–179.

[8] Wang Q, 2023, Research on Security Control of Confidential Information Systems in Computer Networks. Information and Computers, 35(23): 193–195.

[9] Huang J, Cao M, Lin S, 2024, Design and Simulation of a Warehouse Monitoring and Warning System Based on Unity3D. Industrial Control Computer, 37(3): 70–72.

[10] Guo Q, 2024, Greenhouse Intelligent Control System Based on IoT Big Data. Computer Application Digest, 40(22): 66–68.