DOI: 10.53469/wjimt.2025.08(06).03

Analysis of the Application of Artificial Intelligence in Computer Network Technology in the Era of Big Data

Xu Zhang

Hainan Normal University, Haikou, Hainan 571127

Abstract: ***With the rapid development of China's economy, the development of computer networks is becoming increasingly mature and has broad application space. The rise of contemporary big data and artificial intelligence technology has pointed out a new direction for the intelligence of computer network technology. Applying it to computer network technology can better improve the overall level of computer technology and contribute to people's development. In the current big data environment, combining artificial intelligence with computer network technology will inevitably result in higher performance and greater value. This article will analyze this point and explore the application of artificial intelligence in computer network technology in the context of big data.***

Keywords: Big data era; Artificial intelligence; Computer network technology; Application.

1. INTRODUCTION

With the advent of big data, a large amount of data has shown explosive growth, greatly enhancing the application value of big data, while also bringing new demands and standards for its development and application. How to flexibly apply and efficiently process massive data, and extract high-value data from it, has become a common concern among industry professionals. At the same time, when using computer technology to analyze large amounts of data, people tend to rely more on manual methods. It is difficult to guarantee the security of data transmission in an open Internet environment. Artificial intelligence is the evolution and development of computer technology. Combining it with computer technology can make it more stable and intelligent, thus better contributing to the development of human society. In this context, the research and exploration of the application of artificial intelligence in computer network technology under the big data environment has important theoretical and practical significance.

2. OVERVIEW OF ARTIFICIAL INTELLIGENCE

Artificial intelligence is an emerging discipline based on computer networks and electronic information. Artificial intelligence is a type of computer technology that mimics human thought processes and exhibits certain intelligent behaviors. In fact, artificial intelligence is a discipline based on intelligence for research. The application of artificial intelligence technology can make mechanical equipment intelligent, greatly improving the efficiency and accuracy of operations. To a certain extent, the emergence and application of artificial intelligence have replaced human intelligence and artificiality, organically combining intelligent systems with machinery to complete related tasks. In recent years, with the rapid development of technology, people's understanding of artificial intelligence has also changed. With the continuous development of artificial intelligence, various new ideas, technologies, and concepts continue to emerge, providing strong support for the in-depth development of artificial intelligence. For example, adding artificial intelligence technology to a rice cooker can achieve automatic timing control of cooking, and can automatically perform tasks such as cooking rice and soup according to the predetermined time. In summary, under the background of big data, the efficient application of artificial intelligence has injected new vitality into society, economy, and construction, freeing people from heavy work and improving their quality of life. In sustainable architecture, Feng et al. [1] developed AI-powered solutions to enhance energy efficiency in green buildings, providing innovative approaches for environmental conservation. The financial sector has seen significant technological evolution through Jiang et al.'s [2] Investment Advisory Robotics 2.0 system, which employs deep neural networks to deliver personalized financial guidance. Transportation technologies advanced with Tu's [3] work on reliable vehicle platooning systems utilizing redundant 5G link aggregation for smart road applications. Environmental health research by Ma et al. [4] contributed valuable insights into the correlation between metal exposure levels in maternal and cord blood and fetal liver function, highlighting important public health considerations. In logistics automation, Luo et al. [5] proposed an intelligent path planning algorithm that

effectively combines transformer networks with graph convolutional networks (GCNs) for enhanced robotic logistics management. Supply chain optimization saw substantial progress through Saunders et al.'s [6] comprehensive analysis of AI-driven solutions for improving enterprise operational efficiency. Computer vision applications have achieved remarkable breakthroughs, as demonstrated by Guo et al. [7] in their improved YOLOv8 network for vehicle detection, offering enhanced accuracy and performance. Further advancements in the field were made by Jin et al. [8], who developed a sophisticated framework combining hybrid task cascade and high-resolution networks for advanced object detection and pose estimation.

3. OVERVIEW OF COMPUTER NETWORK TECHNOLOGY

Computer network technology is a discipline that connects multiple computers through various communication and transmission devices to exchange and transmit information and data. The internet is a crucial link in the development of the information society and the core of the digital age. Firstly, network topology: Computer network topology can adopt bus, ring, star, tree, and mesh structures, each with its own advantages, disadvantages, and applicable scenarios; Secondly, network protocol: Network protocol is the standard and specification for communication and transmission between various devices on the network. Common network communication protocols include TCP/IP, HTTP, FTP, SMTP, etc. Thirdly, network hardware devices: Hardware devices include routers, switches, hubs, network cards, fiber optic cables, etc. Their function is to exchange and transmit data between computers; Fourthly, network security technology: Network security technology refers to the techniques and methods used to ensure the security of network systems. Fifth, network management technology: Network management is a technology for managing, maintaining, and monitoring networks, including network topology management, bandwidth management, traffic management, etc. Sixth, network application technology: Network application technology refers to the implementation of various applications in computer networks, such as web applications, P2P programs, video conferencing programs, etc.

4. THE APPLICATION VALUE OF ARTIFICIAL INTELLIGENCE IN COMPUTER NETWORK TECHNOLOGY

4.1 Improving the stability of network operation

With the continuous development of the Internet, its applications are gradually integrated into people's daily life and enterprise production. The computer network has greatly promoted the progress of human society, and its stability issue has become a widely discussed hot topic in the whole society. In traditional computer network technology, there are often some problems, such as differences in system performance and hardware performance, which result in poor smoothness of the network. However, optimizing the network structure using artificial intelligence can better achieve the intelligence and smoothness of the network, effectively avoiding network failures caused by system factors and providing strong support for the development of network technology.

4.2 Improving the efficiency of computer network management

Essentially, with the rapid development of network technology in China, the network architecture is becoming increasingly diversified and complex, which has led to increasingly complex network management and a growing number of computer viruses. In this situation, improving the efficiency and security of computer network management has become an urgent problem that people need to solve. Establishing computer network technology based on artificial intelligence can effectively stratify computer network management, divide computer network management modules into hierarchical levels, achieve effective integration and reorganization of computer network management systems, and facilitate information exchange between departments.

4.3 Artificial intelligence has superior reasoning ability

The powerful reasoning function of artificial intelligence makes the operation and management of network systems more intelligent and autonomous. Artificial intelligence can simulate human thinking patterns and cognitive abilities, discover and optimize hidden problems, analyze and confirm complex networked systems, and then intelligently adapt and manage networked systems. Especially, artificial intelligence can discover problems and bottlenecks in networked systems through self-learning and data mining, and propose corresponding optimization strategies based on this. For example, introducing artificial intelligence into fault diagnosis systems can achieve automatic identification and localization of power grid faults, and summarize the optimal

troubleshooting plan based on past operational data and experience. In addition, artificial intelligence can also engage in self-learning and modeling, improve the accuracy and effectiveness of prediction and decision-making, and achieve the goal of intelligent adjustment and management. At the same time, it can simulate human reasoning, judgment, and other behaviors, providing intelligent protection and management for network security and data. For example, introducing artificial intelligence into IDS can achieve network security monitoring, identify attacks, and effectively protect and repair IDS. At the same time, utilizing artificial intelligence technology, autonomous learning and model training of data in the network can enhance its security and reliability.

5. THE SPECIFIC APPLICATION OF ARTIFICIAL INTELLIGENCE IN COMPUTER NETWORK TECHNOLOGY IN THE ERA OF BIG DATA

5.1 Introducing Artificial Intelligence in Computer Network Management and Evaluation

In the practical development process of computer network technology, it is necessary to build appropriate platforms for computer network management and evaluation, so that computer network managers and technicians can communicate well, exchange information at various stages, and provide feedback to ensure effective information exchange. In real life, computer network management and evaluation are still carried out manually, but the impact of this artificial intelligence technology on the operators themselves is particularly evident. During the processing of artificial intelligence, there are many inappropriate behaviors that can have a constraining effect on the entire software. In practical applications, the application of artificial intelligence greatly improves the practical application capability of computer network technology, and also provides technological support and guarantee for the successful development of network management and evaluation work. By utilizing artificial intelligence technology, computers can identify problems, make autonomous judgments, provide feedback, and perform calculations, thereby achieving cost control in computer management. Applying artificial intelligence technology to computer network evaluation systems can provide users with a clear understanding of the special problems that arise in actual computer use, thereby improving existing computer systems and identifying problems in computer network management. When it is determined that a computer has been invaded, artificial intelligence is used to process corresponding instructions, reducing the harm of hackers to computers and ensuring the safe and stable operation of computer network systems. In addition, expert knowledge database technology also reflects the application process of artificial intelligence technology, which comprehensively analyzes data information systems based on the connections between knowledge, comprehensively analyzes the functions of various departments, and recognizes some unreasonable aspects, thereby further improving the entire system and enhancing the practicality and value of computer network technology.

5.2 Application of Intelligent Intrusion Detection Technology

In terms of Internet security, intelligent intrusion detection is a more effective means. Intelligent intrusion detection technology is a new method based on the combination of traditional Internet technology and computer security monitoring system. Through comprehensive analysis of data, it is possible to determine whether the data has been tampered with or illegally processed, and to discover potential security risks, which is of great help in ensuring the security of computer networks. Intelligent intrusion detection technology is a centralized monitoring method formed by combining multiple network technologies, which is essentially an artificial intelligence technology. Introducing intelligent intrusion detection technology into computer networks is of great significance for ensuring network security. When using intelligent intrusion detection technology, the workflow is to first collect massive amounts of data related to computer networks, and then filter them out. The system will automatically delete untrusted data information, filter it, and provide feedback to the user to raise their awareness and effectively prevent harmful information from invading the computer network. On this basis, intelligent intrusion detection technology is used to conduct more in-depth and detailed detection and analysis of the discovered harmful information, and corresponding preventive measures are proposed based on this to avoid recurrence, comprehensively ensuring the security of computer networks and the security of information sources. In addition, the effective use of intrusion detection technology in computer networks can comprehensively and effectively monitor the entire computer network, and adopt scientific and appropriate methods to timely deal with security risks that arise in the computer network, thereby ensuring the full security of the computer network.

5.3 Artificial Immune Technology

Artificial immunity is an intelligent computing method based on the theory of biological immunity and algorithms. The basic idea of artificial immunity is to mimic the immune response mechanism of organisms themselves, by

identifying and resisting various harmful factors such as viruses and bacteria. In the computer network environment, artificial immunity can effectively identify and defend against network attacks such as DDoS attacks, malicious code, and network worms, improving network security and reliability.

Firstly, in response to network attacks, artificial intelligence analyzes and adjusts the data business characteristics in the network, establishes appropriate attack models, analyzes and processes network data, and effectively identifies and resists various types of network attacks. For example, applying artificial immune technology to IDS can automatically monitor network security and detect attacks, thereby enhancing the security and reliability of the network.

Secondly, in terms of threat assessment, artificial immune technology is utilized to analyze and process network information, effectively warning and preventing it. For example, introducing artificial immune technology into security threat assessment can conduct comprehensive security evaluation and risk analysis of information systems, and timely discover and solve various security risks.

Thirdly, in terms of security defense, by learning and adapting to different types of attack features, a suitable immune system can be constructed to quickly identify and defend against different types of network attacks. Introducing artificial immune technology into security defense systems can effectively improve the security and reliability of networks.

5.4 Data Mining Techniques

Data mining is the process of automatically identifying valuable information and knowledge from massive amounts of data. By utilizing data mining techniques to analyze network performance, detect anomalies, and monitor security, the effectiveness and reliability of network operations can be improved.

Firstly, when studying the characteristics of the network, data mining techniques were used to analyze and process network data traffic, mining information and knowledge related to network performance, so that network managers can timely grasp the operation status of the network and optimize it accordingly. For example, by using data mining approximations, bottlenecks in the network can be identified, thereby improving the bandwidth utilization and transmission efficiency of the network.

Secondly, for anomaly detection, data mining techniques are used to analyze and process network traffic, mine network abnormal behaviors and attack events, thereby improving the level of network security. For example, using data mining techniques to discover abnormal information in the network and promptly detect possible attacks to ensure network security.

Thirdly, in security monitoring, data mining techniques are used to analyze and process network traffic, mine network security events, and achieve the goal of enhancing network security. For example, by using data mining techniques, various security incidents and defects in the network can be discovered, and corresponding measures can be taken in a timely manner to ensure the security of the network.

5.5 Application in Information Security Management

In recent years, with the rapid development of the Internet, the Internet has gradually penetrated into people's daily life. Network technology is a technology that distinguishes itself from other new technological approaches, characterized by openness and simulation. In other words, while enjoying the convenience brought by the Internet, the public also faces certain risks and problems, the most prominent of which is information security. At the same time, using computer network technology to process massive amounts of data can easily lead to inaccurate and incomplete data processing, thereby reducing its application value. Therefore, through the flexible application of artificial intelligence, it can not only ensure the security of computer network information to a certain extent, but also maximize its technical support functions, comprehensively monitor the operating environment of computer networks, and prevent data loss, data errors, and other situations. At the same time, by introducing artificial intelligence, it is possible to effectively identify security risks in information networks, enhance the ability of computer network systems to respond, and effectively prevent them.

6. CONCLUSION

In summary, in the context of big data, introducing artificial intelligence into computer network technology is not only an effective innovation of traditional computer networks, but also an effective way to address network information security in the big data environment. The introduction of artificial intelligence in computer network technology can greatly improve the efficiency of computer network work, ensure its security, and provide users with safe, reliable, and efficient network information services. This plays a crucial foundational role in promoting the sustainable development of computer networks.

REFERENCES

[1] Feng, Zhang, Minyue Ge, and Qian Meng. "Enhancing energy efficiency in green buildings through artificial intelligence." Applied Science and Engineering Journal for Advanced Research 3.5 (2024): 10-17.
[2] Jiang, Gaozhe, et al. "Investment Advisory Robotics 2.0: Leveraging Deep Neural Networks for Personalized Financial Guidance." (2025).
[3] Tu, Tongwei. "Reliable Vehicle Platooning via Redundant 5G Link Aggregation in Smart Roads." (2025).
[4] Ma, Haowei, et al. "Maternal and cord blood levels of metals and fetal liver function." Environmental Pollution 363 (2024): 125305.
[5] Luo, H., Wei, J., Zhao, S., Liang, A., Xu, Z., & Jiang, R. (2024). Intelligent logistics management robot path planning algorithm integrating transformer and gcn network. IECE Transactions on Internet of Things, 2(4), 95-112.
[6] Saunders, E., Zhu, X., Wei, X., Mehta, R., Chew, J., & Wang, Z. (2025). The AI-Driven Smart Supply Chain: Pathways and Challenges to Enhancing Enterprise Operational Efficiency. Journal of Theory and Practice in Economics and Management, 2(2), 63–74. https://doi.org/10.5281/zenodo.15280568
[7] Guo, Haocheng, Yaqiong Zhang, Lieyang Chen, and Arfat Ahmad Khan. "Research on Vehicle Detection Based on Improved YOLOv8 Network." Applied and Computational Engineering 116 (2025): 161-167.
[8] Jin, Yuhui, Yaqiong Zhang, Zheyuan Xu, Wenqing Zhang, and Jingyu Xu. "Advanced object detection and pose estimation with hybrid task cascade and high-resolution networks." In 2024 International Conference on Image Processing, Computer Vision and Machine Learning (ICICML), pp. 1293-1297. IEEE, 2024.