Information Systems and Economics (2024)
Clausius Scientific Press, Canada

DOI: 10.23977/infse.2024.050322
ISSN 2523-6407 Vol. 5 Num. 3

The Application of Artificial Intelligence in the Innovation and Development of Computer Network Technology and the Improvement of Economic Benefits

Chengbo Jin

Heilongjiang Weizhong Investment Group Co., Ltd, Harbin, 150000, China

Keywords: Artificial intelligence, computer network technology, innovative development, and improved economic benefits

Abstract: With the rapid development of technology, artificial intelligence (AI) has become an important force leading social progress. Especially in the field of computer network technology (CNT), the integration of AI technology has brought revolutionary changes to the optimization of network performance. CNT, as the infrastructure of modern society, is closely connected to people's daily life and work. However, with the expansion of network scale and the increase in complexity, how to ensure the efficient and stable operation of the network has become an urgent problem to be solved. At this point, the introduction of AI technology becomes particularly important. In network management, AI can optimize the allocation of network resources and quickly locate faults through intelligent analysis, prediction, and automated processing, greatly improving the efficiency and accuracy of network management. Meanwhile, intelligent firewalls and intrusion detection systems utilize AI technology to identify and intercept network attacks in real-time, effectively protecting network security. In addition, AI has also played a crucial role in the innovative development of CNTs. The integration of AI technology not only promotes innovation in network technology, but also promotes the development of related industries, bringing huge economic benefits to society.

1. Introduction

With the rapid development of Internet technology, human society has entered a new information age [1]. As the cornerstone of the information age, the development and progress of CNT directly determine the direction of the entire information technology industry [2]. At the same time, the rise of AI technology has injected new vitality into the development of CNTs and opened a new chapter [3]. CNT not only faces massive data processing needs, but also ensures the efficient, stable, and secure operation of the network [4]. Therefore, CNT has undergone profound changes in system architecture, communication protocols, data processing, and other aspects [5]. With the continuous development of AI technology, its powerful computing power, learning ability, adaptability, and decision-making ability have been widely recognized [6]. AI technology has obvious advantages in data management, risk prevention and control, intelligent puzzle solving, data mining, and other aspects [7]. In terms of data management, AI technology can automatically

classify, organize, analyze, and predict massive amounts of data, providing accurate and timely data support for decision-makers [8].

In terms of risk prevention and control, AI technology can monitor the real-time operation status of the network, identify potential security risks, and take corresponding protective measures [9]. In terms of intelligent puzzle solving, AI technology can simulate the thinking process of human experts, providing users with intelligent answers and suggestions [10]. In terms of data mining, AI technology can extract valuable information and knowledge from massive data, providing strong support for enterprise decision-making and development [11]. With the continuous development of AI technology, more and more people are starting to apply it to CNTs. AI technology can monitor and manage network devices in real-time through network management systems, automatically detect and handle network faults, and improve the stability and reliability of network operation [12]. At the same time, AI technology can also intelligently analyze and predict network traffic, providing scientific basis for network optimization [13]. Traditional firewall technology often struggles to cope with increasingly complex network attacks. And AI technology can learn and recognize network attack patterns in real-time, and automatically update protection strategies, effectively resisting various network attacks.

AI technology can monitor network traffic and packets in real-time, automatically detect abnormal behavior and potential threats, and take corresponding countermeasures. This intelligent intrusion detection technology can greatly improve the security of the network. In the era of big data, AI technology can extract valuable information and knowledge from massive data, providing strong support for enterprise decision-making and development. At the same time, AI technology can also conduct in-depth analysis of network traffic and user behavior, helping enterprises better understand user needs and market trends. The application of AI technology in CNT not only improves the efficiency and security of network operation, but also brings huge economic benefits to enterprises. In short, the rise of AI technology has injected new vitality into the development of CNTs. In the future, with the continuous development and improvement of AI technology, its application in CNT will be more extensive and in-depth, making greater contributions to the development of social economy and the progress of the information technology industry.

2. The Application of AI in the Innovation and Development of CNT

2.1. Network Fault Prediction

With the rapid development of Internet and Internet of Things technology, today's network structure is increasingly large and complex, and the potential risk of network failure also increases [14]. Traditional fault detection methods, which rely on fixed thresholds and rules, are no longer suitable for such dynamic and ever-changing environments [15]. In this context, the introduction of AI technology has brought revolutionary changes to network fault prediction [16]. AI technology can deeply analyze the internal architecture and real-time status of computer systems, and build highly intelligent control mechanisms [17]. Through deep learning and pattern recognition of historical data, AI models can discover abnormal patterns and potential risks in the network, achieving accurate prediction of network faults.

More importantly, AI not only stays at the prediction level, but also automatically triggers emergency response mechanisms when potential signs of failure are detected. This includes automatically adjusting network parameters, changing routing settings, etc., in order to effectively avoid failures and ensure the stability and reliability of the network. As shown in Figure 1, the network fault prediction process includes multiple stages such as data collection, feature extraction, model training, fault prediction, and automatic response. The efficient operation of this process not only greatly improves the intelligence level of network management, but also provides users with a

more stable and reliable network service experience.

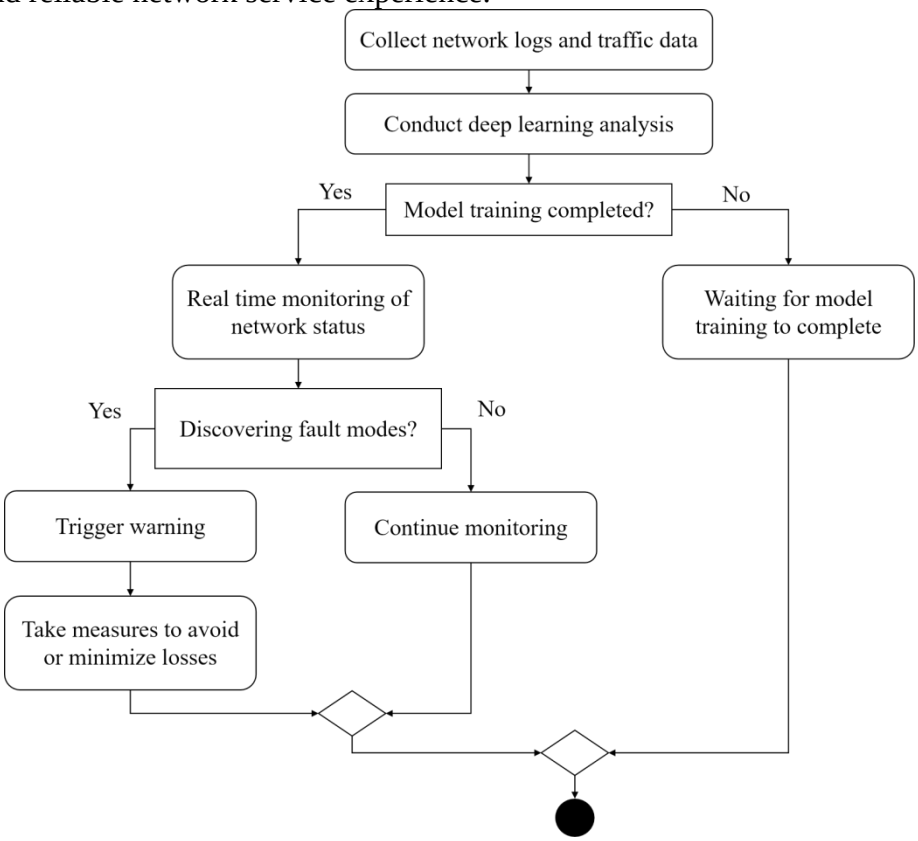

Figure 1: Network fault prediction process

2.2. Security Threat Detection

In modern network environments, security threats have become ubiquitous like ghosts, lurking in every corner of the network, always ready to cause serious damage to user privacy, data, and the entire information system. Faced with these endless threats, the importance of firewall technology as the first line of defense for network security is self-evident. The working principle of traditional firewalls mainly relies on pre-set rules to determine whether data packets can enter the host. This approach can to some extent prevent unauthorized access, but there are also many limitations. Firstly, the formulation of management rules often relies on the experience and knowledge of managers, making it difficult to cope with complex and ever-changing network attacks. Secondly, traditional firewalls are often powerless in the face of new threats due to a lack of intelligent recognition capabilities. However, with the rapid development of AI technology, intelligent firewall technology has emerged. Intelligent firewalls not only inherit the basic functions of traditional firewalls, but also achieve intelligent recognition and analysis of data by introducing AI recognition systems. It no longer relies solely on preset rules, but can automatically learn and adjust protection strategies based on changes in program and data information.

The working principle of an intelligent firewall is that it can analyze data packets in real-time in network traffic and identify potential threats through AI technologies such as deep learning. Once abnormal behavior or suspicious data is detected, the intelligent firewall will immediately intercept and process it to protect the computer from virus attacks. Compared with traditional firewalls, intelligent firewalls have a higher level of automation and intelligence. It does not require frequent alarms and inquiries from users, nor does it require users to have professional network security

knowledge. Through intelligent identification and analysis, intelligent firewalls can greatly reduce the possibility of user misjudgment and improve the efficiency of network security protection. In addition, smart firewalls also have strong scalability and customizability. It can flexibly configure and adjust protection strategies according to user needs and scenarios. At the same time, intelligent firewalls can also be linked with other security devices and services, forming a more comprehensive network security protection system.

3. The Application of AI in Improving the Economic Benefits of CNT

3.1. Improve Production Efficiency

In the rapid development of CNT, the application of AI has penetrated into various industries, especially in improving production efficiency and economic benefits. Among them, adaptive control algorithm, as an important branch of AI, its application in CNT is increasingly highlighting its importance and advantages. Adaptive control algorithms, such as fuzzy logic control and reinforcement learning, are a key technology of AI in industrial production. These algorithms can monitor various parameters and operations in the production process in real time, automatically adjust machine equipment parameter settings, production line speed, etc. by collecting and analyzing real-time data, in order to achieve optimal production efficiency and quality. On the production line, adaptive control algorithms can dynamically adjust production parameters based on feedback signals and objective functions. For example, in an automated assembly line, if a machine or equipment in a certain stage malfunctions or production efficiency decreases, adaptive control algorithms can quickly identify and adjust relevant parameters to ensure the smooth operation of the entire production line. This real-time adjustment capability makes the production process more flexible and efficient, thereby improving production efficiency.

In addition, AI technology can also help enterprises process large amounts of data more effectively. In the era of big data, enterprises are facing massive amounts of data and information. How to extract valuable information from it and use it to guide production and services is the key to improving economic efficiency for enterprises. AI technology can quickly analyze and mine data through automation and intelligence, identify potential problems and opportunities, and provide strong support for enterprise decision-making. AI technology has also played an important role in the quality of products and services. By introducing AI technology, enterprises can achieve automated detection and monitoring of product quality, timely identifying and repairing potential quality issues. At the same time, AI technology can also help enterprises achieve personalized product and service customization, meeting the growing needs of consumers. This consumer centered service model can not only improve consumer satisfaction and loyalty, but also bring more economic benefits to enterprises.

3.2. Market Forecasting

In CNT, the application of AI has brought significant impact on market forecasting and economic efficiency improvement. In terms of market forecasting, AI technology can accurately analyze historical data and predict future market trends through time series models. Firstly, time series analysis is a method of predicting future data based on time correlation and trends. Common time series models include ARIMA and exponential smoothing. These models are capable of processing data with temporal characteristics, such as sales data, stock prices, etc., and predicting future trends through historical data.

According to a study, 380 listed companies have significantly improved the average efficiency of supply chain and market forecasting after using AI technology for market forecasting (as shown in

Table 1). Specifically, after using AI technology, these companies saw an average improvement of 18.14% in market forecasting accuracy and a 31.31% increase in supply chain efficiency. This means that enterprises can respond more quickly to market changes, reduce the risk of inventory backlog and shortages, and improve the efficiency of capital utilization. In addition, AI technology can also process a large amount of market data and discover potential business opportunities from it. Through automated and intelligent data analysis, enterprises can gain a deeper understanding of market demand and consumer behavior, thereby formulating product and service strategies that are more in line with market trends.

Table 1: Increase in various aspects of listed companies

Age	Market forecasting/%	Supply Chain Management/%	Economic benefits/%
2019	3.32	4.37	7.23
2020	4.18	6.41	10.21
2021	7.93	9.43	14.75
2022	21.46	35.68	39.18

4. Conclusions

The role played by AI technology in CNT innovation and economic efficiency enhancement is becoming increasingly crucial. Its deep application not only effectively solves the difficulties in traditional computer network operation and maintenance, such as limited scalability, high energy consumption, and insufficient security, but also greatly promotes the development of computer networks towards more efficient and intelligent directions. The intelligent transformation brought about by AI technology enables computer networks to analyze, predict, and respond to various complex situations in real-time, thereby achieving optimal resource allocation and significant improvement in service quality. This transformation not only enhances the economic benefits of enterprises, but also injects new vitality into the informationization process of the entire society. However, AI technology has also brought new challenges. With the deepening development of technology, how to ensure the security and privacy of data, as well as how to avoid the negative impact that AI technology may bring, has become an important issue that we need to face. In addition, the popularization and application of AI technology also require us to have higher technical literacy and innovation capabilities.

References

[1] Hongfei W. Research on the Application of Big Data and Artificial Intelligence Technology in Computer Network [J]. Modern Electronic Technology, 2020, 4(2): 21-22.

[2] Hua T, Li L. Computer network security technology based on artificial intelligence [J]. Journal of Intelligent & Fuzzy Systems, 2019, 37(5): 6021-6028.

[3] Ayass T, Coqueiro T, Tássio Carvalho, et al. Unmanned aerial vehicle with handover management fuzzy system for 5G networks: challenges and perspectives [J]. Intelligence & Robotics, 2022, 2(1):20-36.

[4] Lee S, Hwang J, Cho E. Comparing technology convergence of artificial intelligence on the industrial sectors: two-way approaches on network analysis and clustering analysis [J]. Scientometrics, 2022, 127(1):407-452.

[5] Gutierrez-Estevez D M, Gramaglia M, De Domenico A, et al. Artificial intelligence for elastic management and orchestration of 5G networks[J]. IEEE wireless communications, 2019, 26(5): 134-141.

[6] Wang H F, Zhang C Y, Lin D Y, et al. An artificial intelligence based method for evaluating power grid node importance using network embedding and support vector regression [J]. Frontiers of Information Technology & Electronic Engineering, 2019, 20(6):816-828.

[7] Bega D, Gramaglia M, Garcia-Saavedra A, et al. Network Slicing Meets Artificial Intelligence: An AI-Based Framework for Slice Management[J]. IEEE Communications Magazine, 2020, 58(6):32-38.

[8] Lin M, Zhao Y. Artificial intelligence-empowered resource management for future wireless communications: A

survey [J]. China Communications, 2020, 17(3):58-77.
[9] Alohali M A, Al-Wesabi F N, Hilal A M, et al. Artificial intelligence enabled intrusion detection systems for cognitive cyber-physical systems in industry 40 environment [J]. Cognitive neurodynamics, 2022, 16(5):1045-1057.
[10] Ran L. Influence of government subsidy on high-tech enterprise investment based on artificial intelligence and fuzzy neural network[J]. Journal of Intelligent and Fuzzy Systems, 2021, 40(2):2553-2563.
[11] Xu X. Link optimization of the new generation instant messaging network based on artificial intelligence technology [J]. Journal of Intelligent & Fuzzy Systems, 2021, 40(4): 6113-6124.
[12] Chen F, Chen F, Liao F, et al. Dynamic governance of social network based on dynamic optimisation algorithm: a new perspective of AI system[J]. International Journal of Technology Management, 2020, 84(1-2): 25-49.
[13] Ping W. Data mining and XBRL integration in management accounting information based on artificial intelligence [J]. Journal of Intelligent and Fuzzy Systems, 2020, 40(1):1-12.
[14] Barros M T, Velez G, Arregui H, et al. CogITS: cognition-enabled network management for 5G V2X communication [J]. IET Intelligent Transport Systems, 2020, 14(3): 182-189.
[15] Ateya A A, Soliman N F, Alkanhel R, et al. Lightweight Deep Learning-Based Model for Traffic Prediction in Fog-Enabled Dense Deployed IoT Networks[J]. Journal of Electrical Engineering & Technology, 2022, 18(3):2275-2285.
[16] Zainaddin D A, Hanapi Z M, Othman M, et al. Recent trends and future directions of congestion management strategies for routing in IoT-based wireless sensor network: a thematic review [J]. Wireless Networks, 2024, 30(3):1939-1983.
[17] Zhao Y, Li Y, Zhang X, et al. A Survey of Networking Applications Applying the Software Defined Networking Concept Based on Machine Learning [J]. IEEE Access, 2019, 7(99):95397-95417.