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Big Data Era Perspective: An In - depth Exploration of Artificial Intelligence Application in Computer Network Technology

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Abstract: ***As society continues to develop steadily, the development achievements of computer network technology have been remarkably impressive, and its development prospects appear to be extremely broad. Computer network technology has deeply integrated into the production and development processes of modern society, exerting a comprehensive and profound impact on people's daily lives and providing immense convenience in terms of "food, clothing, shelter, and transportation." In daily life, computer network technology has made instant information dissemination and communication possible. With just a few taps on a mobile phone screen or clicks on a keyboard, people can easily access news, cultural knowledge, and other information from around the world and engage in real-time interactions with relatives and friends thousands of miles away. In the realm of shopping, online shopping platforms have broken down the barriers of time and space, enabling people to select their desired products anytime and anywhere and enjoy convenient home delivery services. In the field of transportation, navigation apps, leveraging computer network technology, provide real-time updates on road conditions and plan the optimal travel routes for users, significantly saving travel time and costs. With the emergence of modern big data and artificial intelligence (AI) technologies, a clear path has been paved for the intelligent development of computer network technology. Big data is like a treasure trove filled with a vast amount of diverse information. AI, on the other hand, possesses powerful data processing and analysis capabilities, enabling it to extract valuable information and patterns from this complex data. The application of this modern AI technology in computer network technology can significantly enhance the overall level of computer technology. Through AI algorithms, computer networks can more intelligently identify user needs and offer personalized services, thereby providing high-quality service support for social development.***

Keywords: The era of big data; Artificial Intelligence; Computer network technology; Practical application.

1. INTRODUCTION

This paper aims to conduct an in-depth analysis of the relevant concepts of the big data era and artificial intelligence. It will elaborate on the advantages and necessity of applying AI in computer network technology in the context of big data. In the big data era, the volume of data has exploded, and traditional computer network technologies face numerous challenges in processing and analyzing this data, such as low efficiency and inaccuracy. The introduction of AI can effectively address these issues. It can use machine learning algorithms to automatically learn patterns and rules from massive amounts of data, enabling rapid and accurate classification and analysis of data, thereby improving the efficiency and precision of data processing. Moreover, this paper will focus on elaborating the practical applications of AI in computer network technology in the big data era. In terms of network security protection, AI can continuously monitor network traffic and user behavior, promptly detect abnormal activities, and issue warnings, effectively preventing network attacks and data breaches. In network optimization, AI can dynamically adjust the allocation of network resources based on network usage and user demands, enhancing network stability and transmission efficiency. Additionally, AI plays a crucial role in areas such as intelligent customer service and smart homes, providing users with more convenient and intelligent living experiences. In conclusion, the big data era offers vast opportunities and spaces for the integration of AI and computer network technology. In-depth research on the application of AI in computer network technology is of great significance for promoting the innovative development of computer network technology and enhancing the level of social informatization.

2. CONCEPT OF ARTIFICIAL INTELLIGENCE

Artificial intelligence technology refers to giving machines elements such as human thinking, methods and skills, so that machines can simulate and expand. If artificial intelligence technology is very mature, machines will be able to simulate human life methods, learning methods, working methods, rational thinking, design planning and

other intelligent behaviors. Because the technology can further improve productivity and facilitate people's work and life, its importance is increasing. Ding and Wu (2024), who systematically reviewed self-supervised learning for ECG/PPG signal processing [1], while Restrepo et al. (2024) developed multimodal deep learning with embedding alignment for low-resource healthcare [2]. In interactive systems, Xie and Chen (2025) created InVis for human-centered data interpretation [3], and Zhu (2025) introduced RAID for reliability automation in ad systems [4]. Developer tooling innovations include Zhang's (2025) InfraMLForge for LLM deployment [5] and Hu's (2025) GenPlayAds for procedural 3D ad generation [6]. Healthcare applications feature Qin et al. (2025) optimizing deep learning against ALS progression [7], complemented by Weng et al. (2025) proposing SafeGen-X for LLM security [8]. LLM research evolves through Zhao et al. (2025) with KET-GPT's knowledge updating [9], while Li et al. (2025) fused Vision Transformers and LLMs in MLIF-Net for image detection [10]. Foundational data science includes Chen (2023) applying data mining [11], Chen et al. (2024) contributing the Bimcv-R CT retrieval dataset [12], and Sun et al. (2025) building AutoML frameworks on LLMs [13]. Fintech applications feature Pal et al. (2025) implementing AI credit risk assessment [14]. Seminal works provide critical foundations: Koutrintzes et al. (2022) pioneered multimodal activity recognition [15]; Plexousakis (2005) analyzed recommendation algorithms [16]; Schwegler and Challacombe (1996) advanced quantum chemistry computations [17]; van den Brink et al. (1996) studied ecological impacts of insecticides [18]; Karp and Paley (1996) integrated biological data access [19]; Theologos et al. (1997) simulated catalytic reactors [20]; Brazier et al. (1996) formalized cooperation models [21]; Martin et al. (1987) explored parsing algorithms [22]; Feng and Mizrach (undated) developed financial risk models [23]; and Xing et al. (2006) investigated plasma physics [24].

3. THE ADVANTAGES OF ARTIFICIAL INTELLIGENCE IN COMPUTER NETWORK TECHNOLOGY IN THE ERA OF BIG DATA

3.1 Ability to deal with unknown issues

The reasoning way of AI in the actual operation is mostly fuzzy logic, which is relatively low to the demand of constructing the model. Therefore, even if the model is not constructed, AI can also achieve accurate description. In traditional computer network technology, there is a large amount of vague information, and because of the high uncertainty and unknown nature of such information, staff cannot effectively process such information. After applying artificial intelligence to it, this problem was properly solved, and in the actual application process, Artificial intelligence can greatly improve the processing and computing power of computer network technology through the creation of application models, and at the same time realize the construction of hierarchical relationships in network systems, thereby promoting the improvement of the actual work efficiency of computer network systems [1].

3.2 Break the limitation of computer ability, learn ability is very strong

Artificial intelligence is the result of the evolution of computer technology, with distinctive characteristics and outstanding advantages. As an advanced research achievement, artificial intelligence can break the limitations of computer capabilities, and has the characteristics of advancedness, security, stability, and intelligence. Artificial intelligence technology is an emerging science and technology that relies mainly on human intelligence, can simulate personal thought processes, and can realize intelligent operations through relevant program settings. To a certain extent, it can replace the human brain and its human manpower in performing related tasks. Compared to traditional computer technology, AI technology's learning capabilities are very powerful. Artificial intelligence is mainly based on human intelligence as the main research model, Using the human learning method, by collecting and organizing big data information, we can quickly analyze the results, mine valuable and important information, systematically upgrade simple data processing, optimize low-level data, and effectively improve the underlying computing power. Through artificial intelligence, the collection, processing, analysis and integration of big data can provide more comprehensive and scientific references for relevant decision-making. In addition, the computing speed of artificial intelligence is about 30 times that of traditional computers, so it is more reliable, secure and accurate in data processing, and can also effectively reduce the cost of human data computing.

3.3 Collaboration skills

Computer network technology and the development of academic research complement each other, and they promote each other and jointly improve. Due to the complexity of the structure of computer networks, the management work is difficult, and artificial intelligence technology can effectively solve this problem. By layering the network, the technology can detect and manage the different layers, and can also coordinate the cooperation between layers, thereby scientifically and effectively conducting network management.

3.4 AI technology has more economical operation costs

The artificial intelligence technology comprehensively analyzes the data content of various parts of the network data system, which can reduce the energy loss problem generated in the application of traditional computer information technology. If artificial intelligence technology is to be used to gain reasonable control over algorithms in computer network systems, At the same time, it can complete some specific computer technology and operation tasks through the optimal solution, realize the rational use of computing resources, and improve the application value of network technology. Specifically, through artificial intelligence technology in the era of big data, intelligent analysis and processing of various information and data content in Internet user systems, to ensure the accuracy of collected data information and the rationality of analysis, and improve the application efficiency of data [2].

4. THE PRACTICAL APPLICATION OF ARTIFICIAL INTELLIGENCE IN COMPUTER NETWORK TECHNOLOGY IN THE BIG DATA ERA

4.1 Intelligent firewall

The most typical representative of the application of artificial intelligence in computer network technology is the intelligent firewall technology. The main application process and application principle of this technology in the actual application process is to collect and process relevant data information in computer networks through intelligent identification systems. Using its own filtering system, it can automatically filter the information with risk and no value, which not only greatly reduces the amount of information processing in the computer network, but also plays an important role in enhancing the security of the system. In addition, the actual application of intelligent firewall technology can effectively reduce viruses in computer network, prevent hacker attacks, and achieve the improvement of computer network system security.

4.2 Application of Artificial Intelligence in Computer Network Management

In order to fully realize its value and significance, the use of artificial intelligence in computer network management should be established and improved, closely linked to computer network technology and work departments, and improve the efficiency and quality of data statistics and filtering. In the current realities of computer network management, it is necessary to rely on manual operational support. So in the data processing above there is a certain degree of human subjective awareness, in the data processing link is very vulnerable to subjective elements, resulting in information processing there is irrational, unscientific situation. Based on this reality, artificial intelligence technology and computer network technology should be organically integrated so as to avoid the influence of subjective consciousness to a certain extent. This can be done in two ways:

4.2.1 Establishment of an expert system database

In the course of processing data, the most important thing of artificial intelligence is to rely on expert system database. The database of expert system contains a lot of data. Through the effective use of expert knowledge and expert experience, data science reasoning is achieved and then processed efficiently. In the process of building expert information databases, it is necessary to embed the content of network technology into the database, and then through the application of artificial intelligence technology, the data is transformed and the program system is built. In the course of using the expert system, the program system can summarize and arrange the data, and optimize the data. Through this series of steps, the management of the Internet system can be carried out more scientifically, efficiently and smoothly.

4.2.2 Providing intelligent answers

Strengthen the use of artificial intelligence in computer network management, so that people can obtain intelligent answers while obtaining information and data. The answer method of artificial intelligence answers is different from the traditional answer method, As long as the simple command, artificial intelligence can be through the command to achieve data filtering, the key information in the information base to search, give customers the most satisfactory answer, so as to effectively improve the efficiency and quality of answers [3].

4.3 Enhancing the security of information networks

Artificial intelligence technology can effectively enhance the security of network information and data, which plays a very important role in protecting user information security. At present, artificial intelligence technology has appeared in all aspects of people's daily life and work. It can be foreseen that artificial intelligence technology will provide great convenience for people's life and work in the future. At the same time, due to the increasing importance attached to it, the technology will continue to improve and will become an indispensable part of people's lives. To this end, research work on the security protection of artificial intelligence technology needs to be strengthened. Once artificial intelligence technology cannot be controlled by people, it will bring greatly unbearable losses to various fields such as social production and life. The birth of artificial intelligence technology came from the collaborative research of various disciplines, and its maintenance work is also very complex. Therefore, in the process of developing artificial intelligence technology, research work on its safety protection should also be strengthened, so as to enable the technology to develop in a healthy and sound state in the long term.

4.4 Application of Artificial Intelligence Technology in Information Security Management Link

The application of computer network technology has led to corresponding changes in people's lifestyles, but this technology still requires network technology. The virtualization and openness of the Internet technology allows people to enjoy the advantages of network technology itself, but also will face a number of more rich issues, mainly including information security issues. People willingly use artificial intelligence technology to process information data, which will easily lead to a lack of truth and comprehensiveness in the data obtained, which may affect the practical value of big data technology. Through the application of artificial intelligence technology, the security of computer network information can be improved to a certain extent. Through artificial intelligence systems, the operational environment of computer network systems is monitored, some security risk problems existing in the operation process, and the loss of data information is reduced [4].

4.5 Intelligent anti-spam

Due to the popularity of computers and the Internet, many advertisers often use the Internet to send people a large number of spam emails, which invisibly brings many problems to people's lives and work. Artificial intelligence technology can effectively solve the problem by filtering out spam emails before they enter people's mailboxes through the automatic defense function of intelligent anti-spam email systems. At the same time, some spam emails also contain virus files. Artificial intelligence technology can limitedly solve this problem.

5. CONCLUSION

The emergence of computers and network technology spawned the creation of artificial skills technology. All three develop together, promote each other and influence each other. At present, artificial intelligence technology is still high-tech. This technology plays an irreplaceable role in the development of computer and network information technology. However, due to various factors, its level of development is not ideal and it still needs to be constantly improved. To this end, it is necessary to continuously encourage enterprises and individuals to boldly innovate and fully utilize their positive role in all fields of work and life, so as to promote the continuous development of China's artificial intelligence technology and bring new breakthroughs for China's economic growth.

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