

Integrating Intelligent Technologies into Computer Information Systems: Applications and Implications

Longfei Wu

Xinjiang Kunyu Steel Co., Ltd. Xinjiang Kuitun 833200

Abstract: *This article examines the integration of intelligent technologies into computer information systems, highlighting its significant potential. It outlines the foundational aspects of computer information systems and analyzes core components of intelligent technologies. Key applications are discussed, including intelligent decision support, customer service, monitoring, recommendation, and operation-management systems. These integrations not only advance the intelligence of information systems but also drive innovation across various industries.*

Keywords: Intelligent technology; Computer information systems; Application.

1. INTRODUCTION

With the rapid development of information technology, intelligent technology, as one of its core driving forces, is profoundly changing our way of work and life. As the core platform for information processing, the intelligence level of computer information systems directly affects the operational efficiency, service quality, and market competitiveness of enterprises. Therefore, integrating intelligent technology into computer information systems to achieve intelligent upgrades has become an important trend in the current development of information technology. Guo and Tao (2025) conducted modeling and simulation analyses of robot-environment interactions, laying groundwork for autonomous physical systems [1]. Concurrently, We et al. (2025) worked towards intelligent monitoring of anesthesia depth by leveraging multimodal physiological data, demonstrating AI's role in critical healthcare applications [2]. A significant research thrust aims to enhance the transparency and security of AI systems. Zhang (2025) developed an adaptive explainable AI framework for proactive tax risk mitigation in SMEs, moving systems from "black box" to actionable insights [3]. In cybersecurity, Zhang, Bai, and Luo (2025) proposed an AI-driven cloud computing data security monitoring and response system [4]. The security of collaborative learning is addressed by Deng and Yang (2025), who devised multi-layer defense strategies against membership reasoning attacks in federated learning [5]. Underpinning many advanced applications are robust statistical foundations; Lin, Wang, and Hong (2023) detailed the computation of the Poisson multinomial distribution for applications in ecological inference and machine learning [6]. Research also explores AI's role in optimizing digital ecosystems and content generation. Yi (2025) created a system for real-time fair-exposure ad allocation using contextual bandits-with-knapsacks [7]. Advances in enabling hardware, such as the shallow-angle grating coupler for indium phosphide devices by Tang et al. (2020), remain crucial for next-generation systems [8]. In software generation, Guo, Sun, and Xie (2025) introduced an execution-aware hierarchical code generation method using Qwen-72B and retrieval augmentation [9]. Natural language processing continues to evolve with applications in specialized domains. Xie et al. (2024) advanced legal citation text classification using a Conv1D-based approach [10]. In media generation, Fang et al. (2025) presented StreamFlow, a theory and algorithm for high-efficiency rectified flow generation [11]. The application of AI to industrial inspection and document understanding is prominent. Wu, Luo, and Liao (2025) applied multi-level transfer learning for small-sample crack detection in concrete structures [12]. Fu et al. (2026) proposed DMAP, a human-aligned structural document map for multimodal document understanding [13]. In transportation, Abughaida et al. (2024) designed an intelligent blind spot indicator system to prevent lane merge conflicts [14]. Finally, studies address core challenges in data security, content moderation, model enhancement, and information extraction. Deng (2025) proposed a homomorphic encryption-based mechanism for data integrity verification in cloud storage [15]. Chen, Chen, and Tian (2025) built a generative AI comment review system for content compliance [16]. Huang et al. (2025) explored distilling tool knowledge into language models via back-translated traces [17]. Zheng and Jiang (2025) contributed a new methodology for Chinese term extraction from scientific publications [18].

2. OVERVIEW OF COMPUTER INFORMATION SYSTEMS

Computer information systems, as the cornerstone of modern information society, are comprehensive systems that integrate multiple disciplines such as computer technology, communication technology, database technology, network technology, and artificial intelligence technology. It is not only a technological tool, but also a key force in promoting social and economic development, improving management efficiency, and optimizing resource allocation. Computer information systems play an irreplaceable role in a wide range of fields such as municipal engineering, enterprise management, and public services, profoundly influencing our daily lives and work styles. Computer information systems are based on computer hardware and support data collection, storage, processing, transmission, and display through software programs and databases. This process not only requires the system to have high stability and security, but also needs to meet the diverse needs of users and provide convenient and efficient information services. In addition, computer information systems also have powerful data analysis capabilities. In the era of big data, data has become the core asset of enterprises. Through intelligent technologies such as data mining and machine learning, computer information systems can deeply explore the value behind data, discover potential market trends, customer needs, and business opportunities, and provide scientific basis for enterprise decision-making. This data-driven decision-making approach makes strategic planning for enterprises more precise and efficient, helping them to gain a competitive advantage in the fierce market competition.

At the same time, computer information systems also promote the sharing and exchange of information. In the context of globalization, the sharing of information resources has become an important driving force for promoting social progress. Computer information systems break down information barriers between departments, enterprises, and even national borders by building a unified information platform, achieving rapid transmission and widespread sharing of information.

3. THE CORE ELEMENTS OF INTELLIGENT TECHNOLOGY

Intelligent technology, as a shining pearl of technological innovation in the 21st century, is reshaping our world at an unprecedented speed. Its core elements are closely intertwined, jointly building an efficient, precise, and adaptive intelligent technology system, leading the new trend of technological development. In this system, key technologies such as machine learning, deep learning, natural language processing, computer vision, and data mining complement each other, jointly promoting the continuous progress and application expansion of intelligent technology.

3.1 Machine Learning

As the cornerstone of intelligent technology, the importance of machine learning is self-evident. It endows computer systems with the ability to learn and improve themselves, making them no longer just tools for executing preset instructions, but intelligent agents that can continuously optimize algorithms and improve performance based on data feedback. Machine learning enables computers to extract features and discover patterns from large amounts of data, thereby enabling prediction and decision-making of unknown situations. This process does not require manual programming to specify each step of the operation, greatly improving the flexibility and adaptability of the system.

3.2 Deep Learning

As a shining star in the field of machine learning, deep learning has pushed intelligent technology to new heights. Deep learning simulates the connections and information transmission between neurons in the human brain by constructing deep neural networks, achieving deep level analysis and understanding of complex data. This ability has enabled deep learning to make breakthrough progress in fields such as image recognition, speech recognition, and natural language processing, laying a solid foundation for the widespread application of artificial intelligence.

3.3 Natural Language Processing

The rise of natural language processing (NLP) technology has further brought people and computers closer together. NLP technology enables computers to understand, interpret, and generate human natural language, achieving seamless communication between humans and machines. This not only greatly improves the efficiency of information processing, but also enables computers to participate in more complex and diverse interaction scenarios, such as intelligent customer service, intelligent translation, intelligent writing, etc. Through NLP

technology, computers can more accurately understand human needs and intentions, providing more thoughtful and personalized services.

3.4 Computer Vision

Computer vision, as another important field of intelligent technology, endows computers with the ability to "see" the world. Through image processing and pattern recognition technology, computers can recognize and analyze information in images and videos, extract useful features and patterns. This technology plays an important role in fields such as security monitoring, autonomous driving, and medical image analysis, providing strong support for social security and development. The development of computer vision technology not only improves the accuracy and speed of information processing, but also enables computers to understand and perceive the world more intuitively.

3.5 Data Mining

As a part of the intelligent technology system, data mining also plays an indispensable role. Data mining technology provides powerful data support for fields such as decision support, market analysis, and user profiling by mining hidden patterns, associations, and trends from massive amounts of data. Data mining can not only help companies discover new business opportunities and market trends, but also guide them in precise marketing and personalized services, improving customer satisfaction and loyalty.

4. THE SPECIFIC APPLICATION OF INTELLIGENT TECHNOLOGY IN COMPUTER INFORMATION SYSTEMS

4.1 Application of Intelligent Decision Support System

The core value of Intelligent Decision Support System (IDSS) lies in its powerful data processing and analysis capabilities. Faced with the huge amount of data generated in daily operations of enterprises, IDSS can quickly capture and integrate information from different channels and formats, and use advanced data mining algorithms to uncover the deep meaning and potential patterns behind the data. This process not only reduces manual intervention, improves the efficiency and accuracy of data processing, but also makes the decision-making foundation more solid and reliable. On the basis of data analysis, IDSS can also simulate the thinking process of human experts, using knowledge bases and reasoning mechanisms to conduct multidimensional and in-depth analysis of complex problems. By constructing decision models and simulation environments, IDSS can predict the possible consequences and impacts of different decision options, helping decision-makers comprehensively assess risks and opportunities, and thus develop more reasonable and effective strategies. This simulation and prediction capability enables IDSS to demonstrate unique advantages in dealing with decision-making problems with high uncertainty and complexity. In addition, IDSS also has high flexibility and scalability, and with the development of enterprise business and changes in external environment, decision-making needs are constantly evolving. IDSS can adjust and optimize algorithm models according to actual needs, introduce new data sources and analysis tools, and ensure that the system always maintains the ability to make timely decisions.

4.2 Application of Intelligent Customer Service System

The core of this system lies in the deep integration of natural language processing and speech recognition technologies, which together endow intelligent customer service systems with powerful interaction and understanding capabilities, enabling computers to communicate smoothly and accurately with users in the form of natural language, just like humans.

Firstly, natural language processing (NLP) technology is the soul of intelligent customer service systems. Through NLP technology, the system can deeply understand the textual information input by users, including questions, requests, or feedback, in order to accurately capture users' intentions and needs. This process involves complex semantic analysis, syntactic analysis, and contextual understanding, requiring the system to have a high degree of intelligence and flexibility. The application of NLP technology enables intelligent customer service systems to overcome language barriers and effectively communicate with users from different regions and using different languages, greatly expanding the coverage of customer service.

Secondly, speech recognition technology provides a more convenient way for intelligent customer service systems to interact. Users do not need to manually input text, but can interact with the system through voice. This approach not only improves interaction efficiency, but also enhances the immersion and naturalness of the user experience. Speech recognition technology captures the user's speech signal, converts it into text information, and then hands it over to the NLP module for processing. With the continuous advancement of technology, modern speech recognition systems have been able to achieve high-precision speech recognition and maintain stable performance even in noisy environments.

Finally, the intelligent customer service system also has powerful data analysis and mining capabilities. By collecting and analyzing user interaction data with the system, enterprises can gain a deep understanding of user needs and preferences, discover potential market opportunities and business growth points.

4.3 Application of Intelligent Monitoring System

Driven by computer vision technology, intelligent monitoring systems can surpass the limitations of traditional monitoring systems and achieve deep analysis of video images. It can not only capture and record video information, but more importantly, extract key information from it, such as facial features, behavior patterns, etc., and then perform intelligent recognition and judgment. This ability enables intelligent monitoring systems to perform excellently in anomaly detection, whether it is the illegal intrusion of intruders, early signs of natural disasters such as fires, or any other abnormal situations that may affect safety, the system can quickly detect and respond. Among them, facial recognition, as a core function in intelligent monitoring systems, greatly enhances the security and convenience of the system. By comparing the facial information in the monitoring screen with the records in the preset database, the system can accurately identify the identity of specific individuals, providing strong support for applications such as access control and personnel tracking. At the same time, face recognition technology can also help the police to quickly locate suspect and improve the efficiency of case detection. In addition, behavior recognition is another important advanced feature of intelligent monitoring systems. It utilizes advanced technologies such as deep learning to accurately analyze behaviors in videos and identify abnormal behaviors such as running, fighting, and falling. This ability is particularly important in monitoring public places, as it can effectively prevent potential risks such as violent incidents and traffic accidents, and issue timely alerts when incidents occur, buying valuable time for emergency rescue. In practical applications, intelligent monitoring systems have been widely used in security monitoring of public places such as airports, train stations, banks, and shopping malls. It not only improves monitoring efficiency and accuracy, but also reduces labor costs and enhances overall security management level. Moreover, with the continuous advancement of technology and the reduction of costs, intelligent monitoring systems are gradually expanding into more fields, such as smart homes, smart cities, etc., bringing more convenience and safety to people's lives.

4.4 Application of Intelligent Recommendation System

Faced with massive and multi-dimensional user data, data mining techniques can use various algorithms and models to extract valuable information and patterns from it. These pieces of information not only include the user's explicit behavior, such as purchase history, click through browsing, etc., but also encompass the user's implicit preferences, such as subtle signals like dwell time and sliding speed. Through in-depth analysis of these data, data mining techniques have built rich user profiles for intelligent recommendation systems, laying a solid foundation for subsequent accurate recommendations. Machine learning technology is the key to achieving intelligence and automation in intelligent recommendation systems. Machine learning algorithms can automatically learn and optimize recommendation models from data, continuously improving the accuracy and personalization of recommendations. Specifically, machine learning algorithms predict content or products that users may be interested in based on their historical behavior data, and continuously optimize recommendation results through real-time feedback mechanisms. This process is iterative, and as user data accumulates and updates, the performance of the recommendation system will continue to improve, providing users with recommendation services that are more in line with their needs. The application of intelligent recommendation systems is extensive and far-reaching. On e-commerce platforms, intelligent recommendation systems can recommend products that users may be interested in based on their purchase history and browsing behavior, improving conversion rates and user stickiness; In streaming services such as video and music, intelligent recommendation systems can analyze users' viewing history and preferences, recommend personalized content for users, and improve user experience and satisfaction; In social networks, intelligent recommendation systems can recommend friends, groups, or topics that users may be interested in based on their social relationships and behavioral habits, promoting social interaction and information dissemination.

4.5 Application of Intelligent Operation and Maintenance Management System

On the one hand, in the context of cloud computing environment, intelligent operation and maintenance management system has demonstrated its unique advantages. The elastic expansion and on-demand service characteristics of cloud computing have led to an increasing scale and complexity of IT systems, and traditional manual operation and maintenance methods are no longer able to meet the needs of modern enterprises. The intelligent operation and maintenance management system can automatically collect, process, and analyze massive amounts of data from the cloud environment, including system logs, performance indicators, security events, etc., providing clear and intuitive system operation status views for operation and maintenance personnel. This ability enables operations personnel to quickly locate problems, assess the scope of impact, and take corresponding response measures, greatly reducing the time for fault recovery and ensuring business continuity and stability [4].

On the other hand, the application of big data technology provides powerful data processing and analysis capabilities for intelligent operation and maintenance management systems. Through deep mining and analysis of massive operation and maintenance data, the system can discover potential operating patterns and trends, providing scientific basis for operation and maintenance decisions. For example, the system can use big data analysis technology to predict system load peaks, make resource scheduling and expansion preparations in advance, and avoid service interruptions caused by system overload; Meanwhile, by analyzing historical fault data, the fundamental causes and patterns of faults can be identified, providing strong support for fault prevention and optimization.

Finally, automation is another highlight of intelligent operation and maintenance management systems. The system is equipped with rich automation scripts and tools, which can automatically perform daily operation and maintenance tasks such as system inspection, backup and recovery, security scanning, etc., reducing the burden on operation and maintenance personnel and improving work efficiency. In addition, the system also has the ability of intelligent decision-making and adaptive adjustment, which can automatically adjust resource allocation and optimize system performance based on the actual operation and business needs of the system, achieving intelligent and refined operation and maintenance management.

5. CONCLUSION

In summary, from intelligent decision support to intelligent operation and maintenance management, from improving user experience to enhancing system security, intelligent technology is changing the operating mode and value creation of information systems in unprecedented ways. In the future, with the continuous advancement of technology and the continuous expansion of application scenarios, we have reason to believe that intelligent technology will play a more important role in computer information systems, providing more solid support for the digital transformation and sustainable development of various industries. At the same time, we also need to pay attention to the challenges brought by intelligent technology, such as data security, privacy protection, and other issues, to ensure the healthy development of intelligent technology and the harmonious unity of social welfare.

REFERENCES

- [1] Guo, Y., & Tao, D. (2025). Modeling and Simulation Analysis of Robot Environmental Interaction. *Artificial Intelligence Technology Research*, 2(8).
- [2] We, X., Lin, S., Prus, K., Zhu, X., Jia, X., & Du, R. (2025). Towards Intelligent Monitoring of Anesthesia Depth by Leveraging Multimodal Physiological Data. *International Journal of Advance in Clinical Science Research*, 4, 26–37. Retrieved from <https://www.h-tsp.com/index.php/ijacsr/article/view/158>
- [3] Zhang, T. (2025). From Black Box to Actionable Insights: An Adaptive Explainable AI Framework for Proactive Tax Risk Mitigation in Small and Medium Enterprises.
- [4] Y. Zhang, Z. Bai and Q. Luo, "AI-Driven Cloud Computing Data Security Monitoring and Response System," 2025 International Conference on Advances in Electrical Engineering and Computer Applications (AEECA), Dalian, China, 2025, pp. 817-821, doi: 10.1109/AEECA65693.2025.00148.
- [5] Deng, X., & Yang, J. (2025, August). Multi-Layer Defense Strategies and Privacy Preserving Enhancements for Membership Reasoning Attacks in a Federated Learning Framework. In 2025 5th International Conference on Computer Science and Blockchain (CCSB) (pp. 278-282). IEEE.
- [6] Lin, Z., Wang, Y., & Hong, Y. (2023). The computing of the Poisson multinomial distribution and applications in ecological inference and machine learning. *Computational Statistics*, 38(4), 1851-1877.

- [7] Yi, X. (2025, October). Real-Time Fair-Exposure Ad Allocation for SMBs and Underserved Creators via Contextual Bandits-with-Knapsacks. In Proceedings of the 2025 2nd International Conference on Digital Economy and Computer Science (pp. 1602-1607).
- [8] Tang, Y., Kojima, K., Gotoda, M., Nishikawa, S., Hayashi, S., Koike-Akino, T., ... & Klamkin, J. (2020). Design and Optimization of Shallow-Angle Grating Coupler for Vertical Emission from Indium Phosphide Devices.
- [9] Guo, R., Sun, A., & Xie, Y. (2025, October). Execution-Aware Hierarchical Code Generation with Qwen-72B and Retrieval Augmentation. In Proceedings of the 2025 International Symposium on Machine Learning and Social Computing (pp. 417-422).
- [10] Xie, Y., Li, Z., Yin, Y., Wei, Z., Xu, G., & Luo, Y. (2024). Advancing legal citation text classification A Conv1D-based approach for multi-class classification. *Journal of Theory and Practice of Engineering Science*, 4(02), 15-22.
- [11] Fang, S., Zhong, H., Feng, Y., Zhang, Y., & Metaxas, D. N. (2025). StreamFlow: Theory, Algorithm, and Implementation for High-Efficiency Rectified Flow Generation. *arXiv preprint arXiv:2511.22009*.
- [12] Wu, J., Luo, L., & Liao, N. (2025). Small-Sample Object Detection of Surface Cracks in Concrete Structures of High-Rise Buildings via Multi-Level Transfer Learning. *Innovation & Technology Advances*, 3(2), 57–72. <https://doi.org/10.61187/ita.v3i2.262>
- [13] Fu, S., Zhang, Y., Xiang, Y., Du, X., & Tang, J. (2026). DMAP: Human-Aligned Structural Document Map for Multimodal Document Understanding. *arXiv preprint arXiv:2601.18203*.
- [14] Abughaida, A., Daman, L., Song, M., Zhang, Y., & Ayoub, J. (2024). An Intelligent Blind Spot Indicator System to Prevent Double Lane Merge Conflicts (No. TRBAM-24-02945).
- [15] Deng, X. (2025). Homomorphic Encryption-Based Data Integrity Verification and Anti-Tampering Mechanism in Cloud Storage Environment.
- [16] Chen, Rensi, Ziming Chen, and Yueqi Tian. "Building a Generative AI Comment Review System for Content Compliance." Proceedings of the 2nd International Symposium on Integrated Circuit Design and Integrated Systems. 2025.
- [17] Huang, Xingyue, et al. "Distilling Tool Knowledge into Language Models via Back-Translated Traces." *arXiv preprint arXiv:2506.19171* (2025).
- [18] Zheng, H., & Jiang, T. (2025). A New Methodology for Chinese Term Extraction from Scientific Publications. *Innovation & Technology Advances*, 3(2), 19–45. <https://doi.org/10.61187/ita.v3i2.222>