DOI: 10.53469/wjimt.2025.08(05).04

Integration and Development Trend of 5G Communication Technology and Artificial Intelligence

Danying Liu[1], Yun Gao[2]

[1]Shanxi Zhongji Project Management Co., Ltd. Xi an 710075, Shanxi, China
[2]Beijing zhongwang huatong design consulting co., ltd. Beijing 100000, China

Abstract: ***The convergence of 5G communication technology and artificial intelligence has made initial progress and has been applied to varying degrees in numerous fields. In light of this, based on the definition of the concepts of 5G communication technology and artificial intelligence, this paper analyzes the value of the integration and the innovative applications resulting from the fusion of 5G communication technology and artificial intelligence. It also explores the trends in this fusion development, with the hope of further promoting the coordinated development of 5G communication technology and artificial intelligence in China, providing technical support for our countrys social and economic development.***

Keywords: 5G Communication Technology; Artificial Intelligence; Integration; Development Trends.

1. INTRODUCTION

With the continuous development of science and technology, 5G communication technology has emerged and been widely applied in various industries, effectively improving the efficiency and security of mobile communication, and becoming a key research and application exploration topic in China's communication industry. Artificial intelligence, based on computer and big data technology, is an emerging technology that simulates human thinking to make data judgments, providing more convenient and better services for the general public and promoting the improvement of China's social production and living standards and quality. The emergence of 5G communication technology provides important support for the development and application of artificial intelligence technology. In the digital age, the effective integration of 5G communication technology and artificial intelligence helps to improve the speed, automation level, and accuracy of data processing. It plays an extremely important role in the transformation and development of many industries and is also an inevitable path for the construction of digital cities and smart cities. Shen et al. [1] developed an LSTM-based AI system for anesthetic dose management in cancer surgery, while Xu et al. [2] examined adversarial attacks in cybersecurity. Financial innovations include Wang et al. [3]'s deep reinforcement learning approach for supply chain finance and Wang et al. [4]'s end-to-end autonomous driving system. Privacy-preserving technologies have seen significant progress, with Liu et al. [5] proposing a hybrid ensemble model for anomaly detection and Guo et al. [6] addressing imbalanced datasets through focal loss. Model optimization research features Weng et al. [7]'s multi-task fusion framework and Xing et al. [8]'s fuzzy spatiotemporal GNNs for network traffic forecasting. Privacy in NLP is advanced by Wu et al. [9], while Gao et al. [10] enhanced RAG systems using ScaNN and Gemma. LLM capabilities are expanded through Xi et al. [11]'s reinforcement learning augmentation and Liu et al. [12]'s hallucination detection for mathematical reasoning. Computer vision innovations include Lyu et al. [13]'s optimized CNNs for 3D recognition, while Liu et al. [14] developed a cloud-device collaboration framework for personalized generation. Biomedical research by Wang et al. [15] mapped immune microenvironments in gastrointestinal cancers. Urban applications feature Wang et al. [16]'s AI solutions for smart city logistics and Li et al. [17]'s adaptive interfaces for e-government platforms. Medical text processing is addressed by Yuan et al. [18], while Song et al. [19] optimized e-commerce content generation. Geospatial intelligence is advanced by Chen et al. [20], complementing Wang et al. [21]'s legal analysis of enterprise naming rights. Risk management solutions include Gong et al. [22]'s ensemble learning approach, while Bohang et al. [23] improved image steganalysis through active learning. Industrial applications feature Zhao et al. [24]'s deep learning approach for steel production scheduling, demonstrating AI's expanding role in manufacturing optimization.

2. DEFINITION OF 5G COMMUNICATION TECHNOLOGY AND ARTIFICIAL INTELLIGENCE

2.1 5G communication technology

5G communication technology is researched and developed on the basis of 4G communication technology. Compared with previous mobile communication technologies, 5G communication technology has significantly improved information transmission speed, reduced latency, and has the advantages of large broadband and high data transmission stability and security. Analysis of 5G and 4G communication technology network speed data reveals that 4G communication technology is one percent of the peak network speed of 5G communication technology, with download speeds up to 10GB per second, which can meet people's current needs for network usage and data downloads, effectively enhancing users' user experience. In addition, the 5G mobile communication spectrum is concentrated in the mid to high frequency band, and the propagation loss will be relatively stronger. In this case, the construction cost of 5G mobile communication will also increase. Since the successful development of 5G mobile communication technology, China's communication departments and relevant institutions have established 5G mobile communication systems, and 5G mobile communication has been basically popularized in China, promoting the development of China's communication industry and providing important support for the modernization construction, management, transformation, and development of various industries.

2.2 Artificial intelligence

Artificial intelligence is currently a key area of research, development, and application in countries around the world, and is one of the three cutting-edge technologies in the world. It mainly uses computers to simulate human thinking, behavior, and other content, and can react in a way similar to human intelligence in real-world scenarios. Artificial intelligence technology requires the collection, retrieval, calculation, and processing of a large amount of data during its application, and then controls and responds to the terminal accordingly. Therefore, artificial intelligence usually includes big data technology, computer technology, and so on. Due to the large database of artificial intelligence technology itself, when it is applied to devices and systems, workers can simply set up the system or input information keywords to obtain the content they need. At the same time, artificial intelligence technology will automatically calculate and process the data, pushing the most relevant data to the workers. Currently, artificial intelligence has been widely applied in various industries and people's lives, with the most common applications being language recognition, gesture recognition, image recognition, etc., which have improved the convenience of people's production and life. The research, development, and utilization of artificial intelligence are constantly advancing, and the development of artificial intelligence has also promoted the development of various emerging industries, which has to some extent changed the way society produces and lives, providing important impetus for the development of a modern and intelligent society.

3. THE VALUE OF THE INTEGRATION AND DEVELOPMENT OF 5G COMMUNICATION TECHNOLOGY AND ARTIFICIAL INTELLIGENCE

5G communication technology is an inevitable trend in the development of technology and the times, and artificial intelligence is of paramount importance in the future development process. The effective integration of the two can further promote the development and application of 5G communication technology and artificial intelligence. Firstly, the integration of 5G communication technology and artificial intelligence can be applied to communication networks, systems, and devices for management, monitoring, and optimization. This can effectively improve the transmission efficiency of the network, as well as the security and stability of data transmission, providing important guarantees for people's lives and production. At the same time, 5G communication technology also provides important technical support and application foundation for artificial intelligence, which is conducive to the development and expansion of the field of artificial main intelligence, and promotes the maximum improvement of intelligence level. Specifically, artificial intelligence has a certain level of human thinking, and with the support of big data technology, computer technology, etc., it can quickly process, analyze, and organize data, thereby achieving efficient and accurate transmission of data in a relatively short period of time. However, artificial intelligence has high requirements for databases in the application process, and the wide bandwidth of 5G communication technology provides important guarantees for data storage and transmission of artificial intelligence. The integration of the two can fully reflect each other's advantages and promote the prosperous development of informatization and industrialization.

4. THE INTEGRATION OF 5G COMMUNICATION TECHNOLOGY AND ARTIFICIAL INTELLIGENCE

4.1 Virtual shopping

Offline shopping requires a lot of time and energy to try on clothes. With the continuous development of the internet and information technology, online shopping has become people's first choice. However, in the actual process of conducting online shopping, there are shortcomings in grasping sizes, colors, etc., which leads to frequent returns in online shopping. This not only reduces the public's online shopping experience, but also causes losses to buyers to a certain extent. The integration of 5G communication technology and artificial intelligence in virtual shopping has become a current focus of research, development, and promotion. In this virtual shopping process, related devices can recognize buyers' body shape data, provide corresponding sizes for buyers, and buyers can also choose their favorite clothes for online try on and adjustment. During this process, buyers can intuitively see the wearing effect.

4.2 Intelligent Logistics

With the continuous increase of online transactions, logistics has affected every aspect of people's lives. With the support of emerging technologies such as big data and automatic identification, China's logistics is gradually moving towards intelligent and unmanned development. The integration of 5G communication technology and artificial intelligence logistics can promote the development of various contents such as automated sorting and unmanned distribution, and improve the efficiency of logistics sorting and distribution. At the same time, the application of 5G communication technology and artificial intelligence technology can also reduce the labor costs of enterprises. For example, some universities have already started using intelligent robots for logistics and distribution work. During the distribution process, staff can remotely control or directly input routes into the robot's intelligent system, improving the efficiency of logistics and distribution. The application of 5G communication technology and artificial intelligence technology in the logistics field has significant value in promoting the development of the logistics industry.

4.3 Smart Tourism

Under the background of the integration of 5G communication technology and artificial intelligence, the concept of intelligent tourism has emerged in people's vision. Compared with traditional tourism, intelligent tourism under the integration of 5G communication technology and artificial intelligence belongs to a type of virtual tourism. It breaks the constraints and limitations brought by traditional time and space to people. With the support of communication technology and artificial intelligence, VR technology can be used to make videos of corresponding tourist attractions into immersive tourism scenes. Users only need to bring the corresponding devices to experience and visit the places they want to travel anytime and anywhere (as shown in Figure 1). For example, the History Museum virtual reality application launched by the National Museum of England allows visitors to visit museum exhibitions in VR and learn about historical artifacts and cultural heritage. The emergence of 5G communication technology has further enhanced the realism of virtual images, avoiding delays during virtual tourism, and helping to improve the interactivity, authenticity, and experience of virtual tourism.

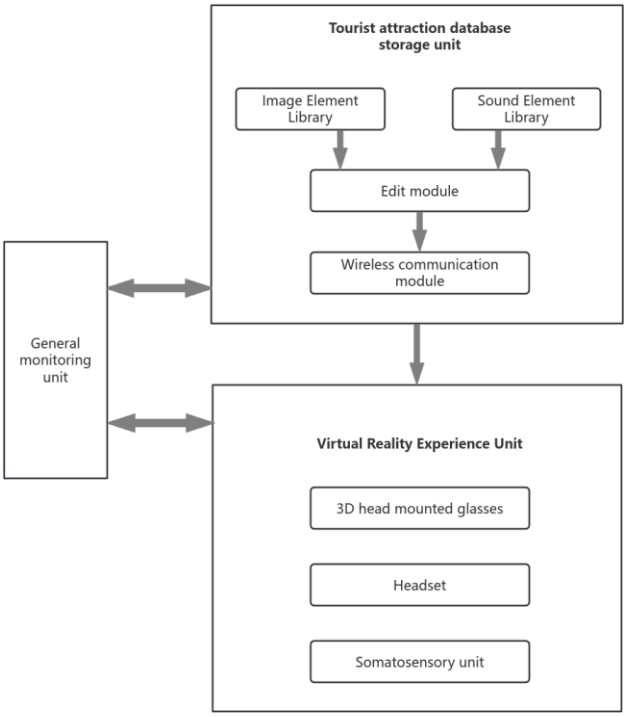

Figure 1: Schematic diagram of virtual tourism

4.4 Construction of modern factories

Production efficiency and benefits are currently of paramount importance in the construction of modern factories. With the continuous development of technology, various automation equipment and systems have emerged in the process of factory construction and production, laying an important foundation for the improvement of factory economic benefits. With the emergence of intelligent devices, modern factories are also facing transformation and renewal. In this context, modern factories can fully integrate 5G communication technology and artificial intelligence into the construction process. On the one hand, 5G communication technology can be integrated into intelligent production equipment, promoting the development of intelligent production equipment in China. At the same time, it can also provide important support for the debugging, intelligent fault detection, diagnosis, and early warning of intelligent equipment. On the other hand, the application of 5G communication technology in intelligent production systems can enhance system security and improve the efficiency and smoothness of device connections, which has important value in improving production efficiency. The effective application of 5G communication technology and artificial intelligence integration in modern factory construction and production can also effectively reduce labor in the factory production process, providing a way to reduce production costs and improve production efficiency.

4.5 Intelligent Parking

With the continuous improvement of China's economy and people's living standards, private vehicles are also increasing. However, the shortage of parking spaces and difficulty in parking have become key issues that need to be addressed. In order to improve the convenience of people's travel, the integration of 5G communication technology and artificial intelligence can establish a parking cloud platform. That is, the government or relevant enterprises can conduct a full investigation of local parking resources and incorporate the data into the database. Then, the parking cloud platform and GPS positioning system can locate the vehicles and push and provide nearby parking resources for use. The integration of 5G communication technology and artificial intelligence technology in the process of use can achieve rapid identification and calculation of parking resources, and precise management of parking spaces, improving the efficiency of data transmission and processing. Travelers can also pre book parking spaces on the platform based on their own travel plans, providing intelligent navigation and parking services for drivers, increasing profits for parking services, and supporting the construction of a harmonious city.

5. THE TREND OF THE INTEGRATION OF 5G COMMUNICATION TECHNOLOGY AND ARTIFICIAL INTELLIGENCE DEVELOPMENT

5G communication technology has gradually covered all aspects of people's production and life. However, with the development of the times and the progress of technology, 5G communication technology also needs to be constantly improved, updated, and optimized. The essence of artificial intelligence technology is actually an imitation technology of human thinking, and mechanical thinking is its dominant work. There are still deficiencies in logical, image thinking, and associative abilities in data retrieval, processing, and other aspects. Therefore, artificial intelligence cannot replace humans. The integration of 5G communication technology and artificial intelligence is an inevitable result of the development of the times and technological progress, providing convenience for more fields and people's lives. However, in the process of integration, due to the large amount of data transmission, data security needs to be fully valued. Therefore, in the future integration of 5G communication technology and artificial intelligence, it is necessary to strengthen the research and processing of data security, ensure the security of information transmission, and also guarantee the privacy of users. In addition, people's demand for personalized services is constantly increasing. Therefore, in the process of integrating 5G communication technology with artificial intelligence, personalized services should also be fully valued, and the process of data collection, processing, and push should be continuously improved to provide users with more comprehensive and targeted services. This will fully reflect the value of 5G communication technology and artificial intelligence, and provide support for social and economic development and progress of the times.

6. CONCLUSION

5G communication technology is currently the most advanced communication technology in the field of mobile communication engineering. Compared with the previously applied 3G and 4G communication technologies, its functions have been significantly improved in all aspects. Its integration with artificial intelligence not only promotes the research and development of both, but also provides important support for the intelligent construction and development of various fields in society, meeting people's needs for technological development. Virtual shopping, intelligent logistics, intelligent parking, and modern factories have greatly improved the convenience of social life and production, promoting social development and progress.

REFERENCES

[1] Shen, Z., Wang, Y., Hu, K., Wang, Z., & Lin, S. (2025). Exploration of Clinical Application of AI System Incorporating LSTM Algorithm for Management of Anesthetic Dose in Cancer Surgery. Journal of Theory and Practice in Clinical Sciences, 2, 17-28.

[2] Xu, J., Wang, Y., Chen, H., & Shen, Z. (2025). Adversarial Machine Learning in Cybersecurity: Attacks and Defenses. International Journal of Management Science Research, 8(2), 26-33.

[3] Wang, Z., Shen, Z., Chew, J., Wang, Y., & Hu, K. (2025). Intelligent Construction of a Supply Chain Finance Decision Support System and Financial Benefit Analysis Based on Deep Reinforcement Learning and Particle Swarm Optimization Algorithm. International Journal of Management Science Research, 8(3), 28-41.

[4] Wang, Y., Shen, Z., Hu, K., Yang, J., & Li, C. (2025). AI End-to-End Autonomous Driving.

[5] Liu, S., Zhao, Z., He, W., Wang, J., Peng, J., & Ma, H. (2025). Privacy-Preserving Hybrid Ensemble Model for Network Anomaly Detection: Balancing Security and Data Protection. arXiv preprint arXiv:2502.09001.

[6] Guo, X., Cai, W., Cheng, Y., Chen, J., & Wang, L. (2025). A Hybrid Ensemble Method with Focal Loss for Improved Forecasting Accuracy on Imbalanced Datasets.

[7] Weng, Y., Fan, Y., Wu, X., Wu, S., & Xu, J. (2024, November). A Multi-Layer Alignment and Adaptive Weighting Framework for Multi-Task Model Fusion. In 2024 International Conference on Intelligent Robotics and Automatic Control (IRAC) (pp. 327-330). IEEE.

[8] Xing, Jinming, et al. "Network Traffic Forecasting via Fuzzy Spatial-Temporal Fusion Graph Neural Networks." 2024 11th International Conference on Soft Computing & Machine Intelligence (ISCMI). IEEE, 2024.

[9] Wu, Yingyi, et al. "Recent Technologies in Differential Privacy for NLP Applications." 2024 11th International Conference on Soft Computing & Machine Intelligence (ISCMI). IEEE, 2024.

[10] Gao, Min, et al. "Leveraging Large Language Models: Enhancing Retrieval-Augmented Generation with ScaNN and Gemma for Superior AI Response." 2024 5th International Conference on Machine Learning and Computer Application (ICMLCA). IEEE, 2024.

[11] Xi, Kai, et al. "Enhancing Problem-Solving Abilities with Reinforcement Learning-Augmented Large Language Models." 2024 4th International Conference on Computer Science, Electronic Information Engineering and Intelligent Control Technology (CEI). IEEE, 2024.
[12] Lyu, T., Gu, D., Chen, P., Jiang, Y., Zhang, Z., & Pang, H. & Dong, Y.(2024). Optimized CNNs for Rapid 3D Point Cloud Object Recognition. arXiv preprint arXiv:2412.02855.
[13] Liu, Y. et al. (2025). SPA: Towards A Computational Friendly Cloud-Base and On-Devices Collaboration Seq2seq Personalized Generation with Causal Inference. In: Hadfi, R., Anthony, P., Sharma, A., Ito, T., Bai, Q. (eds) PRICAI 2024: Trends in Artificial Intelligence. PRICAI 2024. Lecture Notes in Computer Science(), vol 15282. Springer, Singapore. https://doi.org/10.1007/978-981-96-0119-6_25
[14] Liu, M., Bo, S., & Fang, J. (2025). Enhancing Mathematical Reasoning in Large Language Models with Self-Consistency-Based Hallucination Detection. arXiv preprint arXiv:2504.09440.
[15] Wang, Y., Yang, T., Liang, H., & Deng, M. (2022). Cell atlas of the immune microenvironment in gastrointestinal cancers: Dendritic cells and beyond. Frontiers in Immunology, 13, 1007823.
[16] Wang, J. (2025). Smart City Logistics: Leveraging AI for Last-Mile Delivery Efficiency.
[17] LI, X., & Wang, Y. (2024). Deep learning-enhanced adaptive interface for improved accessibility in e-government platforms.
[18] Yuan, J. (2024, December). Efficient techniques for processing medical texts in legal documents using transformer architecture. In 2024 4th International Conference on Artificial Intelligence, Robotics, and Communication (ICAIRC) (pp. 990-993). IEEE.
[19] Song, X. (2024). Leveraging aigc and human-computer interaction design to enhance efficiency and quality in e-commerce content generation.
[20] Chen, J. (2025). Geospatial Neural Networks: Enhancing Smart City through Location Intelligence.
[21] Wang, H. (2024). The Restriction and Balance of Prior Rights on the Right of Enterprise Name.
[22] Gong, C., Lin, Y., Cao, J., & Wang, J. (2024, October). Research on Enterprise Risk Decision Support System Optimization based on Ensemble Machine Learning. In Proceeding of the 2024 5th International Conference on Computer Science and Management Technology (pp. 1003-1007).
[23] Bohang, L., Li, N., Yang, J. et al. Image steganalysis using active learning and hyperparameter optimization. Sci Rep 15, 7340 (2025). https://doi.org/10.1038/s41598-025-92082-w
[24] Zhao, H., Chen, Y., Dang, B., & Jian, X. (2024). Research on Steel Production Scheduling Optimization Based on Deep Learning.

Author Profile

Danying Liu female, born in August 1973, holds a master's degree from Northwest University; I am currently the Director of the Comprehensive Department and Intermediate Communication Engineer at Shaanxi Zhongji Project Management Co., Ltd.

Yun Gao male, Han, born in October 1987, native place: Shangqiu, Henan, education: bachelor's degree, research direction: wireless and 5G technology.