



The Application Status and Development Trends of Artificial Intelligence in the Digital Economy Field

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Abstract: With the rapid advancement of digital technology, the digital economy has emerged as a key driver of global economic growth. As a core technology, artificial intelligence (AI) is now deeply embedded in various facets of the digital economy, transforming production, operations, and consumption. This paper begins by outlining the concepts of AI and the digital economy and examining their intrinsic relationship. It then explores the current applications of AI in key sectors such as digital finance, intelligent manufacturing, digital services, digital agriculture, and data markets. The study further investigates future trends in AI within the digital economy, focusing on technological integration, industrial upgrading, and ecosystem optimization. Finally, it identifies existing challenges and proposes corresponding solutions, aiming to offer theoretical insights and practical guidance for advancing the deep integration of AI and the digital economy, thereby supporting its high-quality development.

Keywords: artificial intelligence; digital economy; application status; development trends; technological integration

1. Introduction

Amid global technological transformation, the digital economy has emerged as a new engine of growth, reshaping traditional economic models and driving profound structural shifts worldwide[1]. Artificial intelligence (AI), as a leading technology in the latest industrial revolution, offers autonomy, self-improvement, and intelligent decision-making capabilities[2]. It addresses key challenges in digital economic development-such as inefficiency, high costs, and complex data processing-and serves as a critical pillar for high-quality growth in the digital economy[3]. In recent years, countries worldwide have prioritized the integration of AI and the digital economy, enacting policies to foster their synergy. For instance, the European Union introduced the Artificial Intelligence Act to regulate AI while advancing digital transformation; China launched the Global Data Security Initiative to support the healthy evolution of the digital economy and the responsible use of AI[4]. In this context, a systematic examination of AI's applications and trends within the digital economy-along with identifying challenges and proposing solutions-holds significant theoretical and practical value for deepening AI integration and enhancing the core competitiveness of the digital economy[5].

This paper reviews relevant domestic and international research, incorporates recent case studies of AI applications in the digital economy, and analyzes the current state of AI across various sectors. It explores future development trends and proposes responses to emerging challenges, aiming to provide meaningful insights for both industry practice and academic research.

2. Overview of Artificial Intelligence and Digital Economy

2.1 Connotation of Artificial Intelligence

Artificial intelligence is an interdisciplinary field encompassing computer science, mathematics, psychology, linguistics, and more. It seeks to simulate and extend human intelligence through technology, enabling machines to perceive, think, decide, and act intelligently[6]. In recent years, driven by advances in big data, cloud computing, and the Internet of Things, AI has evolved rapidly-progressing from narrow applications like speech and image recognition toward more general forms-and has increasingly permeated various sectors of socioeconomic development. Currently, core AI technologies include machine learning, deep learning, natural language processing, computer vision, and knowledge graphs. Machine learning and deep learning serve as the foundational drivers of AI, allowing systems to learn from data, enhance performance, and support intelligent decision-making. Natural language processing and computer vision facilitate human-machine interaction by enabling understanding and communication, while knowledge graphs improve data organization and utilization, boosting both efficiency and accuracy[7].

2.2 Connotation of Digital Economy

The digital economy is an economic form based on digital technology, with data as the core production factor and

digital infrastructure enabling the digital transformation of production, distribution, and consumption[8]. It primarily consists of two components: digital industrialization and industrial digitalization. The former refers to the development of digital technologies and products as industries, such as the internet, big data, cloud computing, and artificial intelligence. The latter involves the application of digital technologies in traditional industries to drive their transformation and upgrading, including intelligent manufacturing, digital agriculture, and digital services[9]. The digital economy is characterized by high efficiency, strong permeability, low resource consumption, and significant innovation potential. It overcomes geographical and temporal limitations, optimizes resource allocation, enhances economic performance, and facilitates the transition from extensive to intensive development models. Globally, the digital economy has become a critical arena for national competitiveness, with its level of development serving as a key indicator of a country's comprehensive national strength.

2.3 Intrinsic Connection between Artificial Intelligence and Digital Economy

Artificial intelligence and the digital economy are interdependent and mutually reinforcing. On one hand, the digital economy provides vast data and application scenarios that support AI development. The vast amounts of data generated across digital platforms offer rich training material for AI algorithms, while the growing demand for intelligent solutions across industries drives continuous innovation in AI technologies. On the other hand, AI serves as a core technological engine for the digital economy. It enables efficient processing and analysis of massive datasets, unlocking data value, optimizing resource allocation, and improving economic efficiency. AI also accelerates the transformation of traditional industries, fosters emerging business models and formats, and injects new momentum into digital economic growth. The deep integration of the two has become an inevitable trend, propelling the digital economy toward a new stage of high-quality development.

3. Application Status of Artificial Intelligence in the Digital Economy Field

In recent years, advances in AI and the rapid growth of the digital economy have led to the widespread application of AI across key sectors, as shown in Figure 1. This has yielded significant results, driving the digital economy's transformation and enhancing both the efficiency and quality of economic development.

3.1 Application in Digital Finance

Digital finance is a key sector of the digital economy, where AI has been deeply integrated across various functions, driving transformative change. In risk control, AI technologies collect and analyze user data-such as credit history, consumption patterns, and income-to build predictive models that accurately identify potential risks and improve both efficiency and precision[10]. For instance, China Merchants Bank employs deep learning-based anti-fraud models, reducing credit card fraud losses to below 0.02 BP. In financial services, AI enables intelligent solutions like 24/7 customer service and advisory, enhancing efficiency, reducing costs, and offering personalized investment advice based on user profiles[11]. AI is also applied in financial regulation, enabling real-time transaction monitoring and early warning systems to support market stability.



Figure 1. Applications of Artificial Intelligence Across Key Sectors of the Digital Economy

3.2 Application in Intelligent Manufacturing

Intelligent manufacturing is a core pillar of industrial digitalization, with AI playing a key role in advancing the industry from automation to true intelligence. In production, AI enables real-time monitoring and predictive maintenance of equipment, reducing downtime and boosting efficiency. For example, Sany Heavy Industry's industrial brain has cut equipment downtime by 30%, while its AI visual inspection system has reduced the missed detection rate to nearly zero[12]. In product design and R&D, AI simulates and optimizes design processes, shortening development cycles and lowering costs. It is also applied in supply chain management to enable intelligent scheduling and structural optimization. As a result, manufacturing is shifting from mass production to customized production, better addressing individual consumer needs.

3.3 Application in Digital Service Industry

The digital service industry is a vital component of the digital economy, encompassing sectors such as e-commerce, logistics, healthcare, and education. AI has been widely applied across these areas, significantly enhancing service quality and efficiency. In e-commerce, AI analyzes consumer behavior to deliver personalized product recommendations, increasing transaction conversion rates and improving the shopping experience[13]. In logistics, AI enables intelligent vehicle scheduling and route optimization, reducing costs and improving delivery efficiency. In healthcare, AI-assisted diagnostic systems rapidly analyze medical images, supporting doctors in making accurate diagnoses-particularly in primary care settings, where they help address resource shortages. In education, AI facilitates personalized learning by tailoring instructional content to individual students' progress and needs, thereby improving learning outcomes.

3.4 Application in Digital Agriculture

Digital agriculture is a key direction in agricultural modernization, and AI is injecting new momentum into its development, driving the shift from traditional to smart agriculture. In crop production, AI enables intelligent monitoring of environmental factors such as soil moisture, temperature, and light, supporting precise irrigation and fertilization that enhance both yield and quality. In livestock farming, intelligent systems are delivering measurable results. For instance, Muyuan's inspection robots monitor pigsties around the clock, enabling early disease detection and rapid replication of expert knowledge across sites[13]. New Hope Group has developed a large-scale pig breeding model that helps standardize industry practices and has increased breeding efficiency by over 30%. Additionally, AI is used in quality inspection and traceability systems, ensuring end-to-end tracking of agricultural products, enhancing food safety, and boosting their market competitiveness.

3.5 Application in Data Element Market

Data is the core production factor of the digital economy, and AI plays a vital role across the data element market-from collection and cleaning to analysis and utilization. AI enables automated processing of massive datasets, enhancing data quality and efficiency while addressing inconsistencies[14]. For instance, domestic teams have developed data cleaning and synthesis pipelines that generate high-quality textbook-level data, significantly improving model performance through feedback training. AI also unlocks data value by enabling rational resource allocation and promoting the circulation of data elements. For example, microfinance banks using federated learning have optimized risk control models without compromising user privacy, increasing the KS value by 15 percentage points. Additionally, AI contributes to data security through real-time monitoring and early warning systems, ensuring the safe circulation of data elements.

4. Development Trends of Artificial Intelligence in the Digital Economy Field

As AI continues to advance and the digital economy deepens, a range of new trends will emerge in the application of AI across digital economic sectors. These developments will further drive the integration of the two and propel the digital economy into a new phase of growth.

4.1 In-depth Integration of AI and Emerging Digital Technologies

In the future, AI will further integrate with emerging technologies such as big data, cloud computing, the Internet of Things, blockchain, and 5G, forming a more robust support system for high-quality digital economy development. Specifically, AI integrated with big data will enhance analytical efficiency and accuracy; with cloud computing, it will enable flexible resource deployment and lower application costs; with IoT, it will drive the evolution toward intelligent perception and control; with blockchain, it will improve data security, transparency, and support autonomous digital asset management; and with 5G, it will enable high-speed, low-latency data transmission, broadening AI application scenarios. For example, the integration of AI and blockchain can be used to analyze smart contracts for vulnerabilities and identify suspicious transactions, advancing the on-chain economy. Looking ahead, the convergence of AI and 6G is expected to support terahertz

communication and blockchain-enabled applications in areas such as the low-altitude economy and autonomous driving.

4.2 Continuous Expansion of AI Application Scenarios

As AI technology continues to advance and digital transformation deepens, the application scenarios of AI in the digital economy will expand across more industries. On one hand, AI will further penetrate traditional sectors such as energy, transportation, and construction, accelerating their digital transformation. On the other hand, it will give rise to new industries, business formats, and models—including intelligent robots, digital humans, and the metaverse—creating new growth drivers for the digital economy. For instance, the metaverse, integrating VR/AR, blockchain, and digital twins, will rely on AI to build immersive virtual spaces for applications like virtual teaching and remote surgical simulation. Meanwhile, digital humans will serve as key interfaces for human-computer collaboration, finding widespread use in customer service, live streaming, and education, offering significant commercial and cultural value.

4.3 Intelligence and Personalization of AI Application

As AI technology advances—particularly in deep learning and natural language processing—its applications in the digital economy will become increasingly intelligent and personalized. On the intelligence front, AI will enable more precise decision-making and control to better support economic activities. On the personalization front, it will more deeply analyze user needs and preferences to deliver tailored products and services, enhancing user experience. For example, in e-commerce, AI will refine product recommendations based on individual habits; in education, it will customize learning plans according to student progress; and in healthcare, it will offer personalized treatment plans based on patient data, improving outcomes. Meanwhile, the rise of AI agents will enable machines to autonomously complete complex tasks, bringing greater convenience to production and daily life.

5. Challenges and Countermeasures of Artificial Intelligence Application in the Digital Economy Field

Despite notable progress, the deeper integration of AI into the digital economy still faces several critical challenges: data security risks, privacy concerns, and data silos that hinder value realization; a global shortage of high-end interdisciplinary AI talent; high costs limiting SME adoption; an imperfect governance system with regulatory gaps and weak international coordination; and poor adaptability of general AI models to diverse industry contexts, where premature transformation may increase operational risks. Addressing these requires a multi-pronged approach: strengthening data security frameworks and promoting data circulation via technologies such as blockchain and privacy computing; accelerating talent cultivation through improved training systems and industry-academia collaboration; reducing application costs via core technology R&D and targeted government support for SMEs; improving governance through comprehensive legislation and active participation in shaping global AI rules; and fostering scenario adaptation by developing industry-specific models, lowering technical barriers with low-code platforms, and guiding enterprises toward gradual, context-appropriate transformation. These measures are essential to realizing AI's full potential in driving high-quality development of the digital economy.

6. Conclusion

As a core technology of the ongoing technological revolution, AI is now deeply embedded in key areas of the digital economy — such as digital finance, intelligent manufacturing, and data markets — driving efficiency and quality improvements. Looking ahead, AI will increasingly integrate with emerging technologies, enabling smarter and more personalized applications, while governance and sustainability continue to improve. However, challenges remain, including data security risks, talent shortages, high costs, and uneven industry adoption. To deepen AI integration into the digital economy, efforts must focus on enhancing data protection, cultivating AI talent, reducing deployment costs, strengthening governance, and improving cross-sector adaptability. These steps are essential to unlocking AI's potential, fostering high-quality digital growth, and boosting global economic momentum.

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