

Legal Protection and Regulation of Artificial Intelligence and Digital Economy

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Abstract: The development of artificial intelligence and the digital economy has profoundly impacted the global economy and society, while also presenting legal challenges such as data ownership, privacy protection, algorithmic discrimination, and platform monopolies. This study examines the current status and challenges of key issues, including data ownership, privacy protection, AI ethics and responsibility, and platform monopolies, from a legal protection and regulation perspective. It reviews relevant literature both domestically and internationally, explores the foundations of legal norms through theoretical perspectives such as law and economics and technology ethics, and proposes practical approaches to build technology-driven legal innovation, improve mechanisms for data ownership and privacy protection, enhance technical regulatory capabilities, and foster international cooperation. The study finds that strengthening the legal system, promoting interdisciplinary integration, and enhancing international cooperation are crucial directions for addressing legal issues in the AI and digital economy. This review provides theoretical support and practical references for future research and strategy-making.

Keywords: Artificial Intelligence; Digital Economy; Data Ownership; Privacy Protection; Algorithm Governance; Platform Monopoly; Legal Norms; Technical Ethics

1. Introduction

The rapid advancement of artificial intelligence (AI) and the digital economy is profoundly reshaping the global economic landscape and social life. AI technology has a broad application range, from smart manufacturing and autonomous driving to

intelligent healthcare and content creation, covering almost every aspect of social life. This technology is driving innovation and transformation across various industries. As intelligent technologies continue to advance, AI is becoming a new driver of economic growth. It not only boosts production efficiency but also spurs the emergence of new industries and job opportunities, infusing the digital economy with continuous vitality. The digital economy, a highly integrated system of informatization, networking, and intelligence, has become a crucial component of the new economic momentum. Its core lies in the production, circulation, sharing, and utilization of data, which supports the training of AI algorithms and decision-making optimization. However, as data becomes a new production factor, legal challenges have emerged. Issues such as unclear data ownership, frequent privacy invasions, algorithmic black boxes and discrimination, and platform monopolies have become significant obstacles to the development of the digital economy. These legal issues not only affect fair competition and technological innovation but can also lead to social unrest, individual rights violations, and even threats to social stability and national security. In particular, the collection and use of data in AI applications often involve a large amount of personal information and private data. Ensuring the privacy rights of data subjects and defining data ownership and usage rights are key legal issues that need to be addressed. Meanwhile, the algorithms of artificial intelligence may subtly exacerbate social inequality, and algorithmic discrimination has garnered significant attention in sensitive areas such as recruitment, lending, and criminal trials. Moreover, the rise of platform economies has led some companies to form 'data barriers' by leveraging their strong market share and user data, thereby excluding potential competitors and leading to market monopolies. Balancing

technological innovation with market regulation is a common challenge for countries worldwide when formulating laws and regulations for the digital economy. As the world's second-largest economy, China's digital economy has grown rapidly. Data shows that in 2023, Beijing's digital economy accounted for 42.9% of its regional GDP, with the growth rate exceeding the initial target of around 6.5%, reaching 8.5%, indicating a growing momentum in development [1]. In 2023, China's digital economy surpassed 50 trillion yuan, accounting for nearly 40% of its GDP. China leads globally in digital infrastructure construction, e-commerce, and digital payments, and has made significant progress in AI applications and data technology. Particularly in the research and application of AI technology, China boasts world-leading technical levels and industrial foundations. However, the rapid development of the digital economy has led to legal frameworks and policies lagging behind, which has become a bottleneck constraining further development. China's current legal system still has gaps and imperfections in data protection, artificial intelligence regulation, platform economy governance and other aspects. It is urgent to solve the legal challenges faced in the current development of digital economy through legal innovation and cross-field cooperation.

In this context, how to regulate and protect artificial intelligence and the digital economy through the rule of law has become a focal point for both academic and practical circles. Strengthening the definition of data ownership, improving privacy protection mechanisms, enhancing the regulation of AI ethics and algorithmic transparency, promoting the application of antitrust laws in platform economies, and fostering international cooperation and legal uniformity have become common goals for countries and globally. Promoting legal innovation in the fields of artificial intelligence and the digital economy is not only essential for safeguarding citizens' basic rights and market fairness but also crucial for promoting high-quality economic development. By comprehensively deepening the legal system for the digital economy, providing legal support for the future development of artificial intelligence technology will be a key direction for future

legal research and policy formulation.

2. Legal Protection and Regulation of Artificial Intelligence and Digital Economy

2.1 Comparative Studies from an International Perspective

2.1.1 EU: leading comprehensive governance framework

The EU has been a global leader in data protection and AI governance. In the late 1990s, the rapid development of the Internet generated a vast amount of data, leading to a series of legal issues, particularly concerning personal data protection. In 1995, the EU enacted the 'Directive on the Protection of Individuals with regard to the Processing of Personal Data by Community Institutions and Bodies,' a landmark document aimed at protecting the personal data privacy rights of EU citizens, regulating the methods and scope of data processing by EU institutions and organizations, and ensuring the free flow of data across member states [2]. The 'General Data Protection Regulation' (GDPR), implemented in 2018, is considered a global benchmark for data privacy protection. Its influence extends beyond the EU, serving as a reference standard for data protection legislation in many countries and regions. The GDPR clarifies individuals' rights to data protection, strengthens the right to consent of data subjects, and introduces principles such as data minimization and data anonymization, contributing to the development of data protection laws worldwide. Following this, the EU further innovated in AI governance by introducing the AI Act, which was published in 2021. This act aims to provide a comprehensive legal framework for the application of AI technology. The AI Act emphasizes the ethical and transparent use of AI, requiring algorithms to be explainable and human oversight, and clarifying the responsibilities of AI systems. The act covers multiple areas of AI, including strict regulation of high-risk AI systems and self-regulation of low-risk systems, reflecting the EU's high standards and comprehensive regulatory approach in AI governance.

The EU's governance framework is characterized by its comprehensiveness and

forward-thinking. It not only focuses on the security and ethical aspects of technology but also emphasizes the balance between fair competition and social responsibility. As a result, the EU is widely recognized as a global leader in AI governance, particularly in integrating AI technology with human rights, social justice, and data protection.

2.1.2 United states: decentralized legal system and technology orientation

Compared to the EU, the United States adopts a more decentralized approach to building its legal framework for artificial intelligence. The U.S. AI legal policies primarily rely on state-level legislation and industry self-regulation, lacking a unified federal legal framework. For instance, the initial fragmented IT legislation in the U.S. focused on data privacy, including the Nevada Data Privacy Act, Virginia Consumer Data Protection Act, Illinois Biometric Information Privacy Act, New York City Biometric Act, Texas Capture or Use of Biometric Identifiers Act, and Washington State Biometric Privacy Act [3]. This fragmented legal system has led to significant differences in regulatory standards for AI across different states.

Despite this, the United States has a significant advantage in driving AI technological innovation, particularly in technology development and market application. The U.S. government supports technological innovation by providing a supportive policy environment and encouraging corporate investment and R&D in the AI sector. American companies, such as Google, Microsoft, and Amazon, have driven the rapid advancement of AI technology and hold a leading position in the global market. Although lacking a unified regulatory framework, the U.S. has gradually established legal constraints to address AI-related ethical and technical issues through targeted legislation and industry self-regulation mechanisms, such as the Algorithmic Accountability Act and the Technical Ethics Committee. The U.S. AI governance model is more technology-driven and innovation-focused, with minimal intervention in market operations. However, it still faces increasingly severe governance challenges in areas like algorithm transparency and data protection.

2.1.3 Other national and international frameworks

In addition to the EU and the US, other countries and international organizations are also actively promoting the governance and ethical norms of AI.

Japan has made significant progress in the ethical aspects of artificial intelligence. In 2019, Japan released the 'Ethical Guidelines for Artificial Intelligence,' which clearly outlines the ethical standards that must be adhered to in the research and development and application of AI technology. The guidelines emphasize that AI development should prioritize human welfare, ensuring the fairness and transparency of technology, and paying attention to privacy protection and data security during its application. This guideline provides clear moral guidance for the healthy development of AI technology in Japan.

Singapore has excelled in the digital economy and data governance, continuously advancing its regulations on artificial intelligence and data protection. In 2012, Singapore enacted the Personal Data Protection Act (PDPA), which laid a legal foundation for the thriving digital economy. The act outlines the basic requirements for data processing and privacy protection and provides a data compliance framework for AI applications. Furthermore, as part of its 'Smart Nation' strategy, Singapore emphasizes a data-driven economic governance model, focusing on the cross-border flow and innovative use of data.

UNESCO: UNESCO (United Nations Educational, Scientific and Cultural Organization) coordinates global policies and laws on AI ethics among countries and international and regional organizations. It has developed a set of internationally recognized guidelines that effectively address AI ethical issues. Leveraging its global and diverse advantages and drawing on long-term experience in formulating rules for science and technology ethics, UNESCO approved the 'Recommendation on Artificial Intelligence Ethics' in 2021 after about two years of deliberation. The Recommendation highlights the close relationship between AI and human rights, laying the groundwork for international cooperation to establish principles and actions that fully respect human rights and the rule of law in the digital world [4].

2.2 China's Legal Practice

2.2.1 Current legal framework

In recent years, China has gradually established a relatively complete legal framework in the field of digital economy and artificial intelligence, especially in data governance. With the advancement of digital transformation, the legal challenges brought by informatization, networking and intelligence have become increasingly prominent. China's legislative departments and judicial organs have intensified efforts to improve and implement relevant laws.

The Civil Code: Article 127 of the Civil Code, which came into effect in 2021, explicitly states for the first time that "data and network virtual property are protected by law." This marks a new phase in China's legal protection of the digital economy and network virtual property. However, while this provision acknowledges data as a form of property right, it does not specify its ownership or usage rules, nor does it provide detailed legal guidelines for the trading and circulation of data. Therefore, defining the ownership, rights holders, and the legality of data transactions remains a critical issue for future legal reforms.

The Cybersecurity Law: The Cybersecurity Law, implemented in 2017, is a foundational regulation introduced by China to address the increasingly complex cybersecurity threats and data security challenges. This law addresses the data protection responsibilities of network operators, network information security, personal information protection, and cross-border data flow, aiming to ensure the safety and order of cyberspace and promote the healthy development of the digital economy. However, with the rapid advancement of technology and the diversification of application scenarios, certain provisions of the Cybersecurity Law need to be updated to keep pace with the times, particularly in areas such as artificial intelligence applications, algorithm transparency, and automated decision-making.

The Data Security Law: The Data Security Law, which came into effect in July 2021, clearly outlines the fundamental requirements for data security management and addresses key issues such as data classification, graded protection, and cross-border data flow. The law aims to enhance the protection of critical data and ensure national data security. Additionally, it defines the responsibilities of data processing enterprises and the regulatory functions of supervisory bodies, laying a legal foundation for the

sustainable development of the digital economy. To ensure effective enforcement, the Data Security Law specifies a series of legal liabilities, with penalties for failing to fulfill data security protection duties. Through these measures, the Data Security Law has successfully established a solid foundation for China's data security governance framework, significantly enhancing the level of data security assurance [5].

The Personal Information Protection Law: The Personal Information Protection Law, which took effect on November 1, 2021, is seen as a landmark regulation in China's data protection efforts. This law provides detailed guidelines for the collection, processing, transmission, and protection of personal information, clarifies the rights of individuals, and establishes a compliance mechanism for handling personal information. In particular, in the context of artificial intelligence applications, balancing technological innovation with personal privacy protection has become a key focus. The law provides a legal framework for data usage and processing, requiring companies to obtain user authorization before handling personal information and to ensure transparency in the processing procedures.

2.2.2 Local regulations and policy trials

In the development of the digital economy, due to the varying natural geographical and economic conditions across different regions, the development of the digital economy varies significantly. Provided that it does not conflict with higher-level laws, local authorities and governments can, based on the specific characteristics of their geographical and economic environments and the current state of digital economic development, take the initiative to legislate on issues arising from the digital economy, thereby addressing the shortcomings of central legislation in coordinating matters across all regions [6].

Zhejiang Province's' Digital Economy Legislation Pilot ': As a pioneer in China's digital economy, Zhejiang is actively exploring new approaches to local digital governance. By implementing a series of policies and regulations for the digital economy, such as enhancing legal norms in big data and artificial intelligence, Zhejiang aims to promote the coordinated development of the digital economy and the legal system. For instance,

Zhejiang has enacted the 'Zhejiang Digital Economy Promotion Regulations,' which detail various aspects of digital economy development, including the cultivation of the digital economy industry, innovation in digital technology, and requirements for data security and privacy protection. Furthermore, Zhejiang has conducted pilot projects on data circulation, data sharing, and digital services, providing valuable experience for national digital economy legislation.

Shenzhen's 'Special Economic Zone Data Regulation': As a window into China's reform and opening up, Shenzhen has been continuously innovating and exploring in the fields of digital economy and data governance. The 'Special Economic Zone Data Regulation' is China's first local data regulation, which clearly outlines the specific rules for data ownership, openness, and utilization. This regulation provides legal protection for data processing and sharing, particularly in the areas of cross-border data flow and privacy protection. Additionally, the regulation introduces the concept of data as an element, 'viewing data as a new production factor and encouraging its use as a key resource for innovation-driven development. The implementation of this local regulation not only boosts Shenzhen's digital economy but also provides valuable experience for the construction of data legal systems nationwide.

3. The Core Issues and Challenges of Legal Protection

3.1 Data Ownership and Privacy Protection

In the development of the digital economy, the issue of data ownership has become a prominent and complex legal topic. As a core production factor, the circulation and utilization of data are directly influenced by the definition of ownership. However, due to its non-exclusivity and replicability, traditional property rights theories struggle to fully apply to data. Article 127 of China's Civil Code clearly outlines the legal protection for data and virtual property on the internet, but it does not provide a detailed definition of data rights.' This ambiguity in defining data rights among producers, collectors, and processors hinders the healthy development of the data trading market and can lead to issues such as data misuse and theft.

Meanwhile, with the widespread application of big data technology and artificial intelligence, privacy protection has become an increasingly serious legal challenge. Traditional legislative models, social values, and protective measures often fall short in addressing the data privacy issues posed by big data and AI, particularly in the age of AI. The unclear definition of the scope and characteristics of data privacy has led to various issues in practice, such as data and privacy breaches, inappropriate recommendations, algorithmic black boxes, and price discrimination through big data, which not only harm personal and public interests but also impede the safe innovation and healthy implementation of AI technology [7]. Furthermore, the widespread use of IoT devices and AI algorithms has further expanded the scope of privacy violations, such as the issue of illegal surveillance by smart home devices, which highlights the inadequacies of the current legal framework in protecting privacy and underscores the urgent need for more stringent legal systems to regulate and standardize these practices.

3.2 Ethics and Safety Regulation of Artificial Intelligence

In the application of artificial intelligence, algorithmic transparency and technical discrimination are two critical issues that need urgent attention. As the core of AI, the decision-making process of algorithms is often fraught with uncertainty, particularly the 'black box' issue, which means that the logic behind algorithmic decisions lacks external explainability and transparency. In practical applications, especially in areas like recruitment and loan approval, algorithms can inadvertently exacerbate biases related to gender, race, and other factors, leading to unfair impacts on certain groups. However, due to the lack of necessary transparency, such discriminatory practices are often difficult to identify and correct. For instance, the COMPAS algorithm in the United States is widely used for criminal risk prediction in the legal field, but research has shown that this algorithm systematically discriminates against Black communities during the prediction process, failing to fairly assess the risk levels of all groups. This phenomenon highlights the issue of algorithmic bias and calls for the legal and technical communities to enhance the

explainability and fairness of algorithms to ensure that their use in critical areas does not lead to social injustice.

At the same time, the ethical risks associated with artificial intelligence (AI) in terms of personality are primarily based on the specific environments in which AI operates. As AI technology continues to improve through deep learning and optimization, it raises questions about whether machines should have human rights and the risks they might pose when liability arises. Additionally, as intelligent robots become more 'human-like,' the anthropomorphization of AI can lead to confusion over the social moral status of humans and robots, potentially leading to ethical risks [8]. In AI applications, particularly in automated systems like autonomous vehicles, determining responsibility in the event of an accident becomes extremely complex. For instance, if an autonomous vehicle causes a traffic accident due to an algorithm error, it is unclear who should be held responsible, especially in a scenario where algorithms make autonomous decisions. This poses unprecedented challenges to traditional product liability principles. China's Civil Code, Article 1165, clearly outlines the principle of 'product liability,' but applying this principle to AI, especially in scenarios involving autonomous machine behavior, remains an open question. Formulating standards for responsibility attribution that align with AI development and ensuring a balance between accountability and technological progress has become a significant challenge for current legal frameworks.

3.3 Competition and Monopoly in the Digital Economy

By integrating and utilizing scattered, isolated data, platform enterprises can fully leverage the deep value of data, effectively allocate data resources, further optimize products and services, and promote innovation. However, when a large amount of data is monopolized and controlled by leading platform enterprises, it can disrupt market competition and lead to data monopolies [9]. For instance, in 2021, Alibaba was fined 18.2 billion yuan by China's State Administration for Market Regulation for allegedly forcing merchants to choose exclusive cooperation between platforms,

which restricted free competition among merchants. This incident marked a significant increase in China's anti-monopoly enforcement, but given the rapid growth of the platform economy, the existing legal framework still struggles to fully address the complexities of platform monopolies. Therefore, improving anti-monopoly laws and policies in the platform economy to ensure fair market competition remains a critical issue.

As a non-rivalrous production factor, data is characterized by its broad accessibility, replicability, and low marginal cost. Platforms can leverage this unique data advantage to create a strong competitive edge, significantly enhancing their market dominance and raising the barriers for new entrants. The new economic model that has emerged from internet platforms is marked by the high integration and concentration of data, which makes data monopolies highly likely [10]. This tendency towards data monopolies further undermines market fairness. As data becomes an increasingly critical competitive asset for businesses, leading platforms have built an unassailable competitive advantage through their vast user bases. This data accumulation effect makes it difficult for new and small-to-medium-sized enterprises to compete, intensifying market concentration and creating significant imbalances in the competitive landscape. For companies lacking sufficient data resources, the barriers to market entry are significantly raised. Additionally, the lack of effective legal mechanisms to facilitate data circulation and sharing among enterprises exacerbates issues of data abuse and monopoly, severely hindering the overall efficiency of the industry. To address these challenges, it is crucial to legislate to regulate data openness and sharing, ensuring that data resources are used to foster innovation and maintain fair competition, thereby optimizing the competitive ecosystem of the digital economy.

4. Future Development Direction and Suggestions

4.1 Improve the Legal System

Data ownership is the cornerstone of digital economy development, involving the rights and obligations of data producers, collectors, and processors. Clear data ownership can effectively reduce legal disputes in data

circulation and provide a legal framework for data transactions. Drawing on the EU's General Data Protection Regulation (GDPR), China can enhance user control over personal data by establishing 'data subject rights, 'such as the right to access, correct, and delete data. Building on the Personal Information Protection Law, China can further refine relevant provisions, particularly by adding specific rights such as the right to portability and the right to be informed about personal data. To advance this process, pilot regions can implement 'data entitlement 'legal practices, such as introducing the concept of 'data usage rights, 'which separates data usage from ownership, thus preventing data circulation from being hindered by ownership disputes. For example, Shenzhen's Special Economic Zone Data Regulations have already established a legal framework for 'public data openness,' setting a good example for the country. Through legislative pilots in different regions, this can gradually provide valuable experience and a legal foundation for nationwide data governance.

As artificial intelligence technology continues to advance, its widespread application across various industries has brought about new legal challenges and social risks, necessitating the formulation of specialized regulations. First, AI laws should address multiple aspects, including algorithm ethics, liability, and transparency. In high-risk areas such as autonomous vehicles and medical AI diagnostics, measures like mandatory certification and risk assessment systems should be implemented to enhance the regulation of AI technology, preventing misuse and potential safety hazards. Second, regarding the intellectual property rights of AI-generated content, while the Civil Code has provided initial protection for virtual assets, there is still debate over whether AI-generated artworks, music, and images can be copyrighted. It is necessary to further clarify the rules for the copyright of AI-generated content, considering the subject, act, and object of AI, to explore the compatibility of generative AI with the copyright system. This will protect the legitimate rights and interests of innovators and technology developers and promote the healthy development of the AI sector.

4.2 Strengthen Technical Governance

Frameworks

Enhancing technical oversight and cultivating interdisciplinary talents are crucial for addressing the legal challenges posed by the rapid development of the digital economy and artificial intelligence. First, establishing independent national technical regulatory bodies to review the safety, transparency, and fairness of AI technology is essential for ensuring the effectiveness of legal enforcement. These institutions can adopt a tiered management model similar to the EU's AI Act, strictly approving and dynamically monitoring 'high-risk AI applications, 'particularly in sensitive sectors like healthcare, education, and finance. They must conduct 'algorithm bias 'checks and privacy compliance reviews to prevent potential social risks. Additionally, using advanced technologies such as blockchain to create an 'algorithm registration and tracking platform' can not only manage AI technology throughout its lifecycle but also ensure that issues are traceable and responsibilities are clear, thereby enhancing regulatory efficiency.

Secondly, cultivating interdisciplinary talents is another key measure to address the rapid technological changes. Legal professionals must have a deeper understanding of technology, so it is essential to enhance the intersection between law and technology. Universities should introduce interdisciplinary courses such as 'Artificial Intelligence and Legal Regulation' and 'Data Ethics and Legal Foundations.' Additionally, legal schools should collaborate with computer science and data science departments to conduct interdisciplinary research projects, promoting the deep integration of law and technology. The state should also support legal professional training programs by providing foundational training in areas like artificial intelligence and big data, helping legal professionals acquire skills such as algorithm evaluation and data auditing, thereby enhancing their technical capabilities in legal practice.

4.3 Promoting International Cooperation

As artificial intelligence and the data economy become more globalized, participating in international rule-making has become a key strategy for China to enhance its influence in global digital governance. First, China should

actively engage in the United Nations and World Trade Organization (WTO) to promote the development of globally applicable AI ethics and data governance rules. For example, it can support the UN's Global Digital Compact initiative to standardize global digital governance. Additionally, within the WTO framework, it is recommended to establish international trade rules for cross-border data flows to provide legal protection for the integration of the global digital economy. Second, China can lead regional cooperation platforms, such as through the 'Belt and Road Digital Cooperation Plan, to work with countries along the Belt and Road to develop AI and data governance rules that fit the region's characteristics, promoting the formation of suitable AI development and usage ethical guidelines in regions like ASEAN.

Regarding cross-border data flows, although data is a core driver of the global digital economy, the differences in privacy protection standards across countries pose significant challenges to these flows. To address this, China should sign bilateral or multilateral agreements to clarify data security responsibilities and legal applicability issues in cross-border data flows. For instance, by signing a data flow agreement with the EU, China can reach a consensus on privacy protection during cross-border data transmission. Additionally, a unified cross-border data review mechanism should be established to promote efficient regulation and balance. This could be achieved through the pilot establishment of an 'International Data Flow Review Institution,' which would facilitate the secure flow of data in critical sectors such as finance and healthcare, while safeguarding national security interests

5. Conclusion

The deep integration of artificial intelligence (AI) and the digital economy is reshaping the global economic landscape and social operations at an unprecedented pace. While this integration unleashes significant development momentum, it also triggers a series of complex legal challenges, including unclear data ownership, fragile privacy protection, ethical issues in algorithms, and the intensification of platform monopolies. This article systematically reviews domestic and

international practices in legal protection and regulation, delves into the core issues and their causes, and concludes that: the EU has established a leading comprehensive governance framework; the US exhibits characteristics of decentralized legislation and innovation-driven approaches; China, while having initially established a legal system and launched local pilots, still faces significant shortcomings in areas such as detailed data rights confirmation, specialized AI regulation (especially for high-risk applications and transparency), and the regulation of platform data monopolies. To address these challenges, future efforts should focus on: first, improving the legal system by addressing data ownership issues, enhancing personal information rights, and accelerating the formulation of specialized AI laws; second, strengthening technical governance by establishing professional regulatory bodies, using new technologies to enhance regulatory effectiveness, and cultivating legal-technology hybrid talents; third, deepening international cooperation by actively participating in global rule-making and promoting mutual trust and coordination mechanisms for cross-border data flows.

The rule of law is the key to balance the vitality of technological innovation with the protection of citizens' rights and the maintenance of fair competition order. This study aims to provide reference for understanding challenges and exploring paths, and help build a legal environment adapted to the development of artificial intelligence and digital economy.

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