Development of Artificial Intelligence in China

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Received November 11, 2025; **Revised** December 17, 2025; **Accepted** December 27, 2025

Abstract

This study aims to investigate the developmental trajectory of Artificial Intelligence (AI) in China to construct a historical periodization and analyze the evolution of AI applications across key sectors. Employing a qualitative documentary analysis method based on government policy papers, industry reports, and patent data from 1978 to 2025, the research examines the interplay between state strategies and technological breakthroughs. The findings categorize China's AI development into four distinct phases: the Initial Stage (1978–2000), Developmental Emergence (2000–2012), Expansion (2012–2015), and the Leapfrog Development Phase (2015–present). The analysis reveals that China's rapid advancement is driven by robust state-led initiatives and private investment, resulting in significant implementation in service, agriculture, and legal sectors. However, despite leading in patent applications, challenges remain regarding core technology dependence (e.g., semiconductors) and the complexity of replacing high-skilled labor. The article concludes by discussing the implications of China's innovation model and future trends in AI governance.

Keywords: Artificial Intelligence; China; Policy; Industrial Development; AI History

Introduction

Artificial Intelligence (AI) refers to the development of systems with cognitive capabilities comparable to human intelligence, encompassing the ability to learn, plan, solve problems, and operate autonomously (Rashid & Kausik, 2024). Regarded as a core component of the industrial revolution, AI is rapidly transforming fundamental sectors such as manufacturing, transportation, and finance, with future expansion expected in healthcare and autonomous driving (Shen & Zhou, 2024; Choi & Yoo, 2025).

In this global context, China has emerged as a leading force in AI development. Driven by state-led strategic planning and massive private investment, China has successfully integrated AI into diverse areas ranging from e-commerce to judicial systems (Gu et al., 2022; Zhou, 2023). However, despite numerous studies on China's technological rise, there remains a lack of comprehensive literature that systematically categorizes the historical trajectory of this development into distinct phases and critically analyzes its sectoral applications alongside existing challenges.

Therefore, this article aims to fill this research gap by achieving two main objectives: (1) to construct a historical periodization of AI development in China from 1978 to the present, identifying key policy drivers and technological milestones; and (2) to analyze the evolution of AI applications in key sectors, specifically services, agriculture, and the legal field. Unlike

previous overviews that focus solely on achievements, this study also examines the structural challenges and limitations inherent in China's rapid AI expansion.

History of Artificial Intelligence Development

Early Stage (1978–2000)

Since 1978, the central government of China has initiated strategic planning for intelligent simulation research, establishing several key research bodies to support this effort. These include the Special Committee on Pattern Recognition and Intelligent Automation, the Chinese Association of Automation, the Chinese Association for Artificial Intelligence, and the Special Committee on Pattern Recognition and Artificial Intelligence under the Chinese Computer Federation. During this initial phase, research focused on theoretical validation, natural language understanding, robotics, and expert systems. Expert systems, which relied on reasoning technologies and mimicked the decision-making capabilities of human specialists in specific domains, were widely applied in agriculture, industry, geological exploration, and other sectors. Commercial expert system tools also began to emerge during this period. However, most expert systems of the time primarily employed deductive reasoning, lacking inductive reasoning capabilities and the ability to autonomously acquire or generate knowledge.

In the 1980s, expert systems increasingly demonstrated potential for commercial application. By the 1990s, several development tools for expert systems had been introduced to the market, such as the "Tianma" Expert System Development Environment and CLIPS. These tools enabled rapid development of expert systems tailored to specific fields. The "Tianma" environment, in particular, featured various inference engines with machine learning capabilities, graphical support, natural language processing interfaces, and deductive databases, significantly enhancing the functionality and efficiency of expert system development.

Development Phase Begins (2000–2012)

With the rapid advancement of machine learning theories and technologies, various methods such as Support Vector Machines based on statistical learning theory, Random Forest, Boosting, and probabilistic graphical models—have been continuously developed and refined. Search engines have evolved significantly, transitioning from manual directory-based information retrieval to automated systems using "web crawlers + ranking algorithms." These modern engines possess increasing capabilities in understanding natural language and interpreting keyword semantics, as well as in weighting webpage relevance based on user interests.

During this period, recommender systems experienced accelerated development. Applications such as targeted advertising, online shopping suggestions, and purchase intention prediction began leveraging user browsing and purchase histories to forecast potential interests. Machine learning has been widely applied in these systems, incorporating product-based recommendation algorithms, user-based algorithms, and hybrid models. Platforms such as Alibaba's Alipay and JD.com have successfully integrated recommender systems to facilitate faster and more accurate product searches for users. For instance, in April 2009, Baidu launched a professional version of its recommendation assistant, which employed machine learning techniques to improve the accuracy of advertisement click-through rates.

Additionally, China has applied artificial intelligence in areas such as intelligent industrial robotics, human-AI interaction, and character recognition. The country has successfully developed several generations of intelligent industrial robots, including radiation source operation robots, mobile printing robots, cutting robots, laser welding robots, screw-locking robots, palletizing robots, and adhesive application robots. These technological

advancements reflect China's commitment to integrating AI into industrial automation and smart manufacturing at an advanced level.

Expansion Phase (2012–2015)

During this period, the rapid advancement of cloud computing technologies and processing capabilities of hardware components—such as Graphics Processing Units (GPUs), Field-Programmable Gate Arrays (FPGAs), and Tensor Processing Units (TPUs)—has significantly enhanced the performance of image recognition, speech recognition, and natural language processing systems. The continuous improvement in these computational technologies has strengthened the fundamental processing capacities required for AI development.

Leading Chinese technology companies, including Baidu, Tencent, Alibaba, and Huawei, have actively engaged in artificial intelligence research and innovation. For instance, Baidu established an AI research center in Silicon Valley in 2014 and signed a strategic partnership with BMW to co-develop autonomous driving technologies, also setting up a dedicated office for intelligent vehicle systems. Tencent launched its Intelligent Computing and Search Lab in 2015 and unveiled the DreamWriter robot for automated content generation. Alibaba has focused on building foundational platforms, introducing the DTPAI AI platform and investing strategically in SBRH, a robotics company in collaboration with Foxconn. Notably, Huawei founded the Noah's Ark Lab in 2012 to conduct advanced AI research, with a focus on data mining, neural response models, and the development of deep learning-based single-round dialogue systems.

In addition, iFlytek introduced an open cloud platform in 2010, offering developers free intelligent services, such as speech synthesis, speech recognition, voice activation, and semantic understanding. Similarly, Tupu Technology developed a cloud-based image recognition platform in 2014, utilizing deep learning techniques to provide various interfaces for enterprises and developers. These included services for content moderation, facial recognition, text recognition, natural scene analysis, image enhancement, and reverse image search.

During this era, investment and financing activities in China's AI industry have grown at an unprecedented rate. In 2015, AI-related investments increased by a factor of 23 compared to 2012. The AI investment rate reached 67.65%, with the overall investment intensity surpassing that of other industries by two to three times.

Breakthrough Development Phase (2015–Present)

Since 2015, China's artificial intelligence (AI) technologies and AI industry have experienced rapid and significant advancement, driven by robust government policies and substantial financial support. At present, China's three major internet corporations have launched initiatives focused on Brain-Inspired Intelligence and AI platforms, achieving practical applications in fields such as customer service, finance, and beyond. China's AI research has yielded remarkable outcomes, with Chinese inventors filing 15,745 AI-related patent applications—ranking second globally. In the area of speech recognition, major global technology companies such as Baidu, Google, and SoundHound had already achieved accuracy rates exceeding 90% as of 2015. With ongoing advancements in AI technologies, the implementation of AI has rapidly expanded across sectors including transportation, healthcare, education, and manufacturing, demonstrating both technological maturity and wide-ranging societal impact.

Table 1. Number of Artificial Intelligence Patent Applications in Major Cities and Provinces in China (2010–2019)

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019

Beijing	534	733	1041	1350	1585	2263	3322	3896	5232	3871
Guangdong	273	371	679	883	914	1510	2718	4245	6896	5171
Jiangsu	240	908	570	699	861	1281	1701	2200	3083	2416
Shanghai	249	256	362	401	436	740	1038	1355	2005	1661
Zhejiang	153	173	258	365	434	705	1063	1540	1955	1551
Sichuan	64	90	151	246	363	576	836	1037	1404	953
Shandong	60	101	153	226	274	582	706	827	1107	874
Anhui	29	63	95	170	261	310	628	778	1222	687
Shaanxi	112	129	268	275	349	402	487	618	805	630
Hubei	60	86	101	168	212	291	523	774	991	849
Liaonin	74	81	104	170	202	280	398	424	555	392
Tianjin	53	71	149	120	167	352	378	375	526	404
Fujian	23	35	63	81	135	250	404	437	695	544
Hunan	33	56	59	83	123	219	343	543	584	475
Chongqing	48	38	87	95	127	221	260	376	599	486
Henan	35	33	56	65	94	182	248	392	561	275
Heilongjiang	54	53	93	103	136	141	197	229	290	269
Hebei	11	26	19	65	67	110	245	236	298	287

Note: Liu et al. (2020)

In the field of chip development, China is actively advancing its Loongson chip series. *Loongson Technology Co., Ltd.*has released the second-generation Loongson processors, including the 3A3000 and 3B3000 models, which operate at a base frequency of 1.5 GHz. These processors outperform Intel's Atom series and high-end ARM processors in terms of performance.Another notable innovation is in Brain-Inspired Intelligence chips. The College of Computer Science at Zhejiang University, in collaboration with Hangzhou Dianzi University, developed China's first Brain-Inspired Intelligence chip, "Darwin", in 2015. This chip, made using silicon-based CMOS material, supports spiking neural networks (SNNs). In the area of servers, Inspur and Baidu jointly launched the SR-AI integrated rack server, an ultra-large-scale AI computing platform designed for big data and deep neural networks. This platform supports up to 64 GPUs and offers a maximum processing capacity of 512 TFLOPS.

In terms of platforms, the "National Engineering Laboratory for Deep Learning Technology and Applications" led by Baidu has been officially established. This initiative will launch a series of specialized platforms, including a deep learning platform, a biometric recognition platform, an auditory perception platform, a visual perception platform, a next-generation human-computer interaction platform, an intellectual property platform, and a standards platform. Tencent has also officially established an artificial intelligence laboratory, unveiling a robotics platform designed to promote technology sharing. Meanwhile, Alibaba Cloud has pivoted toward AI technologies by developing the ET Industrial Brain platform. This platform plays a key role in production process control, process optimization, and error prediction, thereby helping companies achieve intelligent upgrading.

Recent applications of artificial intelligence technology have included intelligent customer service, automated summarization, and financial auditing. For example, in 2016, Alibaba launched its AI-powered customer service robot, "Ali Xiaomi", which integrates technologies such as speech recognition, semantic understanding, personalized recommendation, and deep learning. During the Double 11 Shopping Festival, *Ali Xiaomi* served over 6.32 million customers, equivalent to the workload of 52,000 customer service representatives working 24 hours a day. In the same year, the Zhejiang Higher People's

Court announced the launch of an intelligent speech recognition system capable of accurately and rapidly transcribing court proceedings. The system was piloted in the Xihu District People's Court, where it achieved a recognition accuracy rate of 96%.

The Development of Artificial Intelligence Applications in the Service Industry

The advancement of artificial intelligence (AI) has driven innovation in machinery within production processes, enhancing the benefits of machine operations. Machines now possess higher production efficiency and are less likely to cause complications arising from human-related conflicts. As a result, machinery innovation has enabled machines to replace human labor in tasks that are simple, repetitive, and monotonous. This substitution has significantly increased production efficiency. However, AI technology still cannot replace labor in tasks that are complex and demanding at present (Choi & Yoon, 2025). In China, the service industry accounts for over 50% of the total economy. AI has been applied across various service sectors, including hospitality, internet-based services, transportation, healthcare, domestic services, and technology support services. In the hospitality industry, robots can deliver food, cook based on recipes, and control in-room devices. However, they still face limitations in customer interaction and in serving food directly to customers, as robots with advanced mobility are often too expensive for restaurants or hotels to invest in profitably. AI is also used in customer service, particularly in handling online inquiries or answering customer support calls. Nonetheless, these AI systems often fall short of accurately resolving all types of customer problems (Zhai & Liu, 2023). In the healthcare sector, AI applications focus on services such as beauty enhancement and therapeutic massage. Meanwhile, in domestic services, AI is used for household tasks and to assist with elderly care.

The Development of Artificial Intelligence Applications in Agriculture

The application of artificial intelligence (AI) in agricultural production in China is still relatively recent; however, it has developed at a rapid pace. AI can be applied in various aspects of agriculture, including seed selection, soil composition detection and analysis, temperature control in crop cultivation, irrigation water analysis, pest and disease identification, weed control, fertilizer and pesticide management, plant grafting, crop yield prediction, agricultural product inspection, and online distribution of agricultural products. Seed selection is one of the most critical steps in the crop production process. AI technology can significantly improve the efficiency of seed quality identification by collecting traits of high-quality seeds and relevant data to build classification models. For example, the ET Agricultural Brain developed by Alibaba Cloud is capable of predicting the yield and quality of agricultural products, analyzing market supply and demand, and generating intelligent cultivation plans based on sales data. It can also model plant growth and determine optimized water and fertilizer plans for the entire growth cycle. This allows for real-time decision-making regarding water and fertilizer usage, effectively reducing input costs and increasing crop yields. Additionally, image recognition technology is used to track and count agricultural assets, enabling better planning for order fulfillment in farming operations (Wang et al., 2025).

China is rapidly advancing the use of artificial intelligence in agriculture, applying AI to every stage from seed selection and soil monitoring to yield prediction and market analysis, driving greater efficiency and higher crop yields.

Development of Artificial Intelligence Applications in the Legal Field

In China, artificial intelligence technology was first applied in the legal field in 1979 by the scientist Xuesen QIAN, who is regarded as a great scientist nationwide. He pointed out that building the rule of law in China requires a comprehensive set of laws, regulations, and

rules integrated from the central government to local levels to create a rigorous and scientific legal system. The application of modern science and technology serves as a driving force to promote the development of this legal system. In 1993, under the leadership of Professor Tingguang ZHAO, China developed the "Practical Criminal Law Expert System," which consists of three main subsystems: a consultation and retrieval system, an auxiliary judgment system, and an auxiliary trial system. Since the beginning of the 21st century, the application of artificial intelligence (AI) within Chinese courts has primarily concentrated on three key areas. First, AI technologies such as intelligent file recognition and imaging have been employed to develop an integrated system for the transmission, reception, and aggregation of electronic files, thereby enabling the creation of extensive datasets to support intelligent trial processes. Second, AI facilitates the advanced analysis and processing of legal data, allowing for the referencing of pertinent cases, the examination of legal evidence, the drafting and revision of legal documents, and ultimately providing decision-making support for judges. Third, the adoption of intelligent voice recognition technology has significantly improved the efficiency and accuracy of recording trial proceedings, produced trial transcripts, and prepared judicial judgments (Makulavati, 2025). These advancements collectively contribute to the modernization and increased effectiveness of the judicial system in China (Yao, & Hui, 2020).

China is rapidly emerging as a global leader in artificial intelligence (AI), driven by strategic government initiatives, large-scale investments, and ongoing industry-academic collaborations. The country is pursuing broad, deep integration of AI technologies across sectors, aiming to transform the economy and society by 2030.

Knowledge from Research

1. The history of AI development in China can be divided into four main phases: the initial phase (1978–2000), the growth phase (2000–2012), the expansion phase (2012–2015), and the leapfrog phase (2015–present). Each stage features strategic drivers and state support, along with private sector investment.
2. AI has been applied across multiple domains including industry, services, agriculture, and the legal sector—for example: product recommendation systems, industrial robots, medical diagnostics, judicial decision support, and advanced data and voice processing.
3. China has achieved major innovations, such as developing AI brain platforms, leading-edge image and speech processing systems, supercomputers, and brain-inspired intelligence chips for deep learning applications.
4. Since 2015, investment in AI in China has surged, with China becoming the world's second-ranked country in terms of AI patent applications, reflecting strong research capabilities and innovative output.
5. The impact of AI in China includes increased efficiency, reduced costs, and new opportunities for business, agriculture, and services, while there remain limitations in replacing human labor for highly complex tasks.

Conclusion

This study successfully constructs a historical periodization of AI in China, delineating four phases from 1978 to the present, and confirms the extensive integration of AI into service, agricultural, and legal sectors driven by a unique state-market dual engine. While the findings highlight rapid technological catch-up, sustainable growth faces critical constraints, particularly regarding dependence on foreign core technologies (e.g., semiconductors) and ethical challenges in algorithmic governance. Consequently, this research suggests that future studies should move beyond macro-historical overviews to conduct empirical micro-analyses of firm-level adoption and the social implications of AI workforce displacement.

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