CP Global Insight

2025: does PRC industrial AI have an edge?

May 2025

Beijing made AI a priority back in 2017 with the State Council's 'Next Generation AI Development Plan', aiming to become a global leader by 2030. Xi Jinping reasserted this goal in April, framing AI as a force that will 'profoundly change human society and the world'.

An 'infrastructure first' approach to AI has been Beijing's preferred option, placing fiscal support behind a national data centre network. Local governments raced to build their own facilities and firms stockpiled foreign high-end chips—often without regard for efficiency or demand—resulting in a mix of world-class and underused centres.

Tighter oversight has followed, and new sites have been concentrated in designated national hubs. AI regulation is stepping up, going beyond deployment to shaping rules for politically sensitive content, both domestic and international.

Hitting goals set for 2020 and 2025 has been patchy. The most common uses of AI remain at the level Beijing calls AI 1.0: single-task applications. While flagship factories integrating AI are proliferating, scale rollout remains far away for most of the SMEs that dominate 'Made in China'. Scale adoption is a big challenge.

A typical late-developer, Beijing prioritises open-source software and hardware R&D. PRC tech elites are generally more sceptical than their US counterparts about the sector reaching 'general intelligence' soon. Domestic models, primarily built by private firms, face the same limits as elsewhere: hallucination, high costs and energy overheads. Data generated is often too fragmented and messy for models, and milestones in creating a national data market have not been met.

The sudden success of Deepseek sparks debate on the rationale of US curbs on GPU exports to slow PRC progress. But rollout strategies reveal even greater contrasts: US firms focus on consumer and services-oriented applications, whereas the PRC sees its edge in its vast industrial base and rich operational data to promote AI into manufacturing and logistics.

Monthly **Insight Briefs** explores trends in PRC industry policy. Upcoming issues feature:

- June: Industrial decarbonisation strategies
- July: Low-altitude economy
- August: Trade dynamics—navigating tariffs and securing supply chain

---

key takeaways

The integration of AI into the PRC industrial landscape remains modest and uneven, with productivity gains elusive. Large language models promise revolutionary impact but often falter in real-world environments. More conventional innovations—the washing machine, the refrigerator and container shipping—have arguably done more to boost productivity to date.

From quality control to predictive maintenance, most current AI deployments remain rooted in narrow, first-generation use cases. The broader leap to general-purpose AI is confined to elite firms and experimental zones at high cost.

The prospect of next-generation AI at scale faces familiar hurdles: fragmented infrastructure, messy data, high costs, and, not least, persistent technical flaws like hallucination, discrimination and weak generalisation. For small and mid-sized manufacturers—the vast majority of 'Made in China'—the AI revolution remains more hype than reality.

> **for small and mid-sized manufacturers—the vast majority of 'Made in China'—the AI revolution remains more hype than reality**

Beijing's strategy balances ambition with pragmatism. Faced with structural limitations in foundational AI and a late start in advanced chip development, it turns to its strength: a vast manufacturing base and top-down coordination.

Rather than fully embracing the global race toward artificial general intelligence (AGI), Beijing is embedding AI in tangible applications (hardware, edge devices, and industrial systems), where it sees more immediate and strategic value. In this view, the industrial heartland offers a more grounded path to impact than speculative frontiers like AGI.

In the face of US export restrictions, PRC firms are pivoting, exploring more efficient architectures and localised alternatives. Policymakers are fostering open-source collaboration where possible, while steadily localising key technologies. Crucially, the focus is shifting from sweeping breakthroughs to practical deployment: tailoring AI to the unique PRC industrial structure and solving the bottlenecks of real-world adoption.

This signals a pragmatic and potentially enduring path: one that also begins to reckon with the ethics of AI, public trust, and the social fabric such technology will inevitably reshape.

This brief outlines

- how Beijing views the industrial potential of AI
- how PRC AI research and commercial development work, and where Deepseek fits within it
- how the PRC hardware ecosystem, from chip development to cloud computing, is adapting to US sanctions
- the state of AI deployment in manufacturing, smart cars, robotics, healthcare and software

'AI 2.0'

Developing for over half a century, AI breakthroughs in the early 2010s were heralded as the arrival of a new era. Unprecedented volumes of data could now be applied to training models; these would thereby accurately interpret visual, auditory, and linguistic data. Still higher-powered learning and inference were to follow.

Dubbing it 'AI 2.0', PRC policymakers place it front and centre in shifting the economy onto a more tech-driven path, as returns to housing and traditional infrastructure investment fall.

Mainstream AI development has since 2022 shifted focus from task-specific 'discriminative' models (e.g. for facial recognition, object detection, text classification) to large general-purpose generative ones. Lifelike language generation and realistic image and video creation are no longer hypothetical; with this ability to create content, automated driving and humanoid robots seemed close at hand.

With 'AI+', a 2024 program, Beijing strives to blend AI into industry and service sectors, in the belief that AI's value lies not only in foundational research or big models, but in application across all sectors to drive modernisation.

> **Beijing believes AI's value lies not only in foundational research…but in application across all sectors to drive modernisation**

who makes AI policy

As in so many other areas, Xi Jinping is not reported as guiding AI R&D personally, but his support is visible. He chaired an AI Politburo study session in April 2025 and visited a hub in Shanghai, placing the sector high on the agenda. It is part of the 'fourth industrial revolution' the leadership sees unfolding.

The Ministry of Science and Technology (MoST) leads AI policy development through its AI Planning Promotion Office. Since 2023, MoST has operated under the direction of the Communist Party's Central Science and Technology Commission, headed by Vice-Premier Ding Xuexiang 丁薛祥, a close confidante of Xi.

The National Natural Science Foundation of China, previously under MoST but since 2023 subordinate to the State Council, oversees the High-Tech Research and Development Centre, which manages the 'National AI megaprojects' focused on basic research. But total funding for these projects from 2018–22 was ~C¥2.4 bn (US$330 mn), a relatively modest amount compared to the scale of AI investments by major tech companies today.

The Ministry of Industry and Information Technology (MIIT) sets national AI standards and plans integration with industry, while the **National Development and Reform Commission** (NDRC) and its sub-agency, the **National Data Administration**, direct the AI infrastructure build-out. **The Cyberspace Administration of China** regulates AI-related content and algorithms, while the **Ministry of Education** oversees talent development.

AI, Beijing hopes, may turn PRC factories from labour- to capital-intensive via intelligent automation. Bolstering the manufacturing sector, this would avoid losing steam as the economy transitions, a cause of the middle-income trap.

Policy advisors point out that AI could also upset an economic theory called Baumol's cost disease: when service-sector productivity increases at a lower rate than manufacturing, the shift to a more services-based economy will mean slower economic growth. The hope is that AI, by boosting productivity in traditionally low-productivity services like healthcare and education, could break this pattern and sustain economic growth.

chasing AI

The arrival of the new AI era marked a break with the playbook that powered the internet economy, where private firms like Alibaba, Baidu, Tencent and Huawei prospered by adapting ideas via incremental innovations. Why could Beijing not just let businesses get on with it?

The problem has been that while PRC firms lead in experimentation, they traditionally spent little on basic R&D compared to global competitors. AI research was primarily done at universities and research institutes, or more likely acquired from abroad.

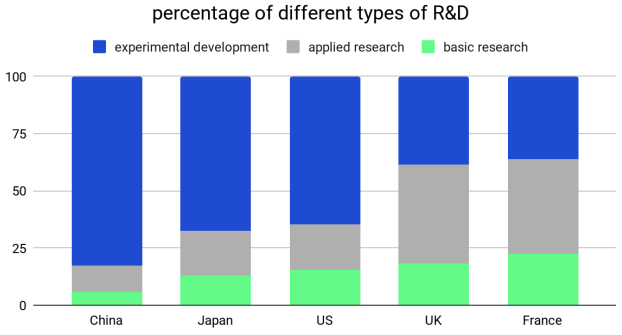
> **PRC firms lead in experimentation… AI research was primarily done at universities**

AI research breakthroughs still mainly happen in universities and public research institutions like the Chinese Academy of Sciences, according to a ranking of top global AI institutions by the Emerging Technology Observatory. That contrasts with the US, where breakthrough AI papers are authored by a mix of universities and private sector firms like Google.

With endorsement from the centre, large cities like Beijing, Shanghai, Hangzhou and Shenzhen set up dedicated AI research labs from 2017–20, deepening the role of state-backed institutes.

Those labs and universities have produced top-class researchers and attracted back Chinese academics trained at top overseas universities.

US companies were major contributors to PRC-based AI research in the 2010s, but with deteriorating relations that has changed—Microsoft has already shut down its Zhangjiang AI and IoT Lab—once the flagship of the 2019 Shanghai AI Zone.



source: OECD, Report on China R&D Expenditure 2024

public platforms

Beijing's AI strategy seeks to place firms at the centre of a state–industry–academia collaboration model. Policymakers call this the 'new whole of nation system', where researchers and firms work together in the national interest using a mix of policy and market-based incentives, coordinated by the state.

> **AI strategy seeks to place firms at the centre of a state–industry–academia collaboration model**

MoST is also the backbone and organiser of the research ecosystem in this approach. It supports research in key AI technologies (see page 6), including that on more speculative developments, such as alternatives to large models, like game intelligence, which applies AI and game theory to strategic domains like cybersecurity and regional energy competition, and bionic intelligence, which draws on biological systems to develop adaptive machines for challenging environments in fields like aerospace, defense, green energy, and smart agriculture.

Through a bidding process, in 2019 MoST started tasking mostly private companies to develop 'public platforms' that would be open to other firms and government bodies to use (see table below).

In return, leading companies (often in partnership with universities or research institutes) received funding and permits for pilot projects in special zones.

national new-gen AI public innovation platforms
新一代人工智能开放创新平台

national champion	national platform (sub-sector)
Alibaba	city brain
Baidu	autonomous driving
Tencent	medical imaging
iFlytek	voice recognition
SenseTime	smart vision
Yitu Technology	visual computation
MiningLamp Technology	marketing intelligence
Huawei	basic software and hardware
Ping An Insurance	inclusive finance
Hikvision	video sensing
JD.com	smart supply chain
Megvii Technology	image sensing
Qihoo 360	security brain
Xiaomi	smart home
Kuaishou Technology	content generation
SANY Group	construction
TAL Education Group (Xueersi)	smart education
Changzhou Institute of Mechatronic Technology (Zhongke Tech)	robotics
NetEase	education and entertainment
Ningbo Industrial Internet Institute	intelligent manufacturing

Public platforms have achieved some success. For example, Baidu's Apollo autonomous driving platform forms the basis for robotaxis launched in China's cities, and has been used by BYD, the largest PRC automaker. Huawei's platform, integrating its Pangu model and Ascend chips, is used in at least 14 pilot cities for a wide range of digital city and industrial applications: smart city management, urban safety, healthcare, manufacturing, and digital agriculture.

large models

The public platform approach, with a focus on specific 'vertical' uses, was to some extent superseded by the rise of large 'horizontal' models in the past five years.

But the focus on open source remains: global AI development is still mostly about international collaboration through open source and open trade.

For instance, large language models worldwide often use Google's Transformer, a deep learning architecture that revolutionised natural language processing in 2017. The 'AI stack', layers of software that support the deployment of models, is largely open source.

With open-source models and software, China can lower entry barriers, increase collaboration and reduce (but not eliminate) dependencies on foreign IP that could be subject to sanctions.

Most PRC large model projects are shared on open-source platforms like Hugging Face and Microsoft's GitHub, where Huawei, Tencent and Alibaba all rank among the most active contributors.

government as VC

Rather than relying on direct subsidies, Beijing opted for an equity investment model through state-backed guidance funds that would also signal where the state wants capital to flow.

Beijing and Shenzhen city-controlled funds acquired stakes in Zhipu AI in 2024.

In early 2025, the National Semiconductor Guidance Fund set up a C¥60 bn (US$80 bn) National AI Fund. It will invest across the entire AI industry chain over the next 13 years, covering computing power, algorithms, data and enabling applications.

Shanghai has a C¥22.5 bn (US$3 bn) fund dedicated to AI, while Guangdong has reportedly matched this number through various funds. This year has seen the launch of a C¥10 bn (US$1.3 bn) Shenzhen AI Fund, and the 100 bn (US$13 bn) Beijing AI Fund.

Unlike basic research, China's private sector dominates in building large models, both in number and in quality.

> **the private sector dominates in building large models, both in number and in quality**

By 2024, the best-performing models included Alibaba's Qwen and Bytedance's Doubao, with Baidu's

Ernie model lagging behind. Those big players' models were rivalled by the 'four AI tiger' start-ups Zhipu, MiniMax, Moonshot AI and Baichuan.

All these models were left behind by Deepseek's R1 launch in January. To some extent, Deepseek is in line with trends in China: it is open source, and much of its talent emerged from local universities. But in other ways, Deepseek stands out as being outside of Beijing's 'whole of nation' plan: it was self-funded, receiving little direct state support.

Deepseek's emergence in early 2025 has led to a major rethink among rival companies, with Baidu incorporating R1 into its search engine.

Others are narrowing their focus, with Baichuan pivoting to healthcare applications. Some industry leaders, such as Baidu's Robin Li, called for such a shift earlier: duplicating large models is a waste; what is needed is specific applications, he said in 2024.

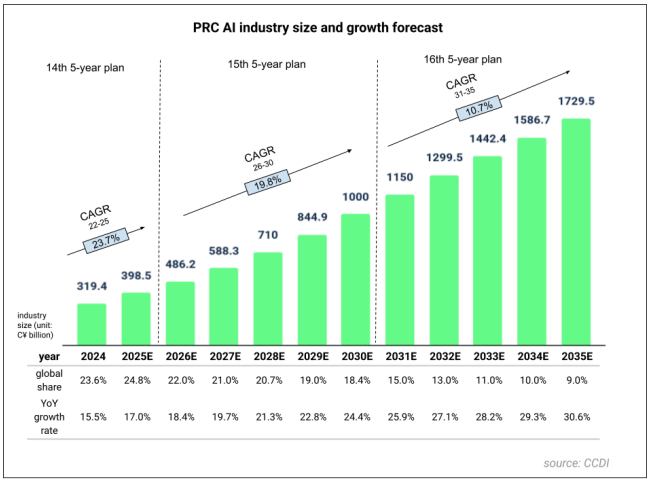
ecosystem and prospect

There are currently over 1 million companies involved in the PRC AI industry chain, according to data intelligence firm Huoshi Zaochan

- 76,000 at the technology layer (machine learning frameworks and algorithms)
- 330,000 firms in the infrastructure layer (computing power and data storage
- 630,000 at the application layer (products and services)

China Centre for Development of Industrial Informatisation Consulting, an advisory affiliated with MIIT, forecasts gradual growth in the PRC AI industry

- compound annual growth of 15.6 percent
- valued at C¥400 bn (US$55 bn) in 2025, crossing C¥1 tn (US$140 bn) by 2030, to C¥1.7 tn (US$230 bn) by 2035



regulation and control

Beijing places emphasis on standards and regulations, engaging experts from state institutions like the Chinese Academy of Engineering and Tsinghua University to shape the process.

> **Beijing places emphasis on standards and regulations**

The most important AI regulations are the 2021 regulation on recommendation algorithms, 2022 rules for deep synthesis (synthetically generated content), and 2023 rules on generative AI.

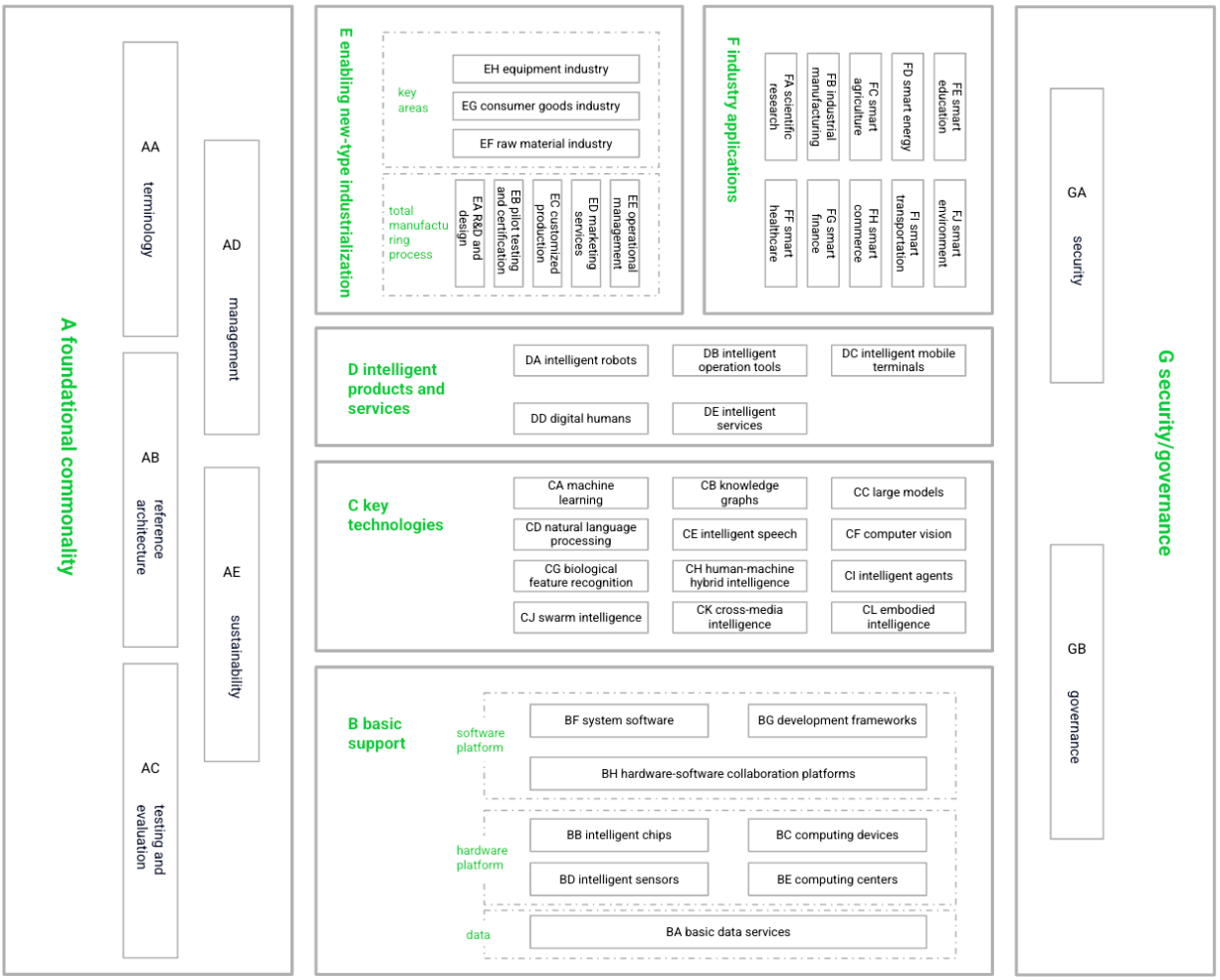
These rules aim to align the rapid development of generative AI with the Chinese Communist Party's control over sensitive information and public discourse, but they also contain practical provisions that are increasingly relevant internationally, for instance, mandatory labelling of AI-generated images, transparency obligations, and restrictions on content generation capabilities. These could inform other jurisdictions' approaches.

Notably, public policy scholar Xue Lan 薛澜, chair of the National AI Governance Professional Committee, is a key advocate for an 'agile governance' approach.

The model stresses early detection of emerging risks, rapid regulatory response, flexible and adaptive tools (favouring guidance over penalties), and a collaborative relationship between regulators and regulated entities.

On the international stage, Beijing is asserting its regulatory vision through initiatives like the Global AI Governance Initiative (2023) and the Shanghai Declaration on Global AI Governance (2024). Both give weight to a bigger voice for developing countries and the UN, positioning the PRC as a counterweight to US and EU-led approaches.

AI standardisation framework



The AI Standardisation Strategic Framework, issued in July 2024 by MIIT, serves as a technical and governance blueprint for developing and deploying AI. It outlines 50 national and industry standards. These are legally or administratively endorsed documents to ensure AI systems are safe, interoperable, reliable, and aligned with national development goals. These 50 standards are scheduled to be in place by 2026, with 20 of them endorsed internationally.

top advisers

AI strategy is spearheaded by the Chinese Academy of Engineering (CAE) with the National Strategic Advisory Committee on AI, headed by CAE academician Pan Yunhe 潘云鹤.

Two Politburo study sessions on AI, in 2018 and April 2025, were led by CAE academicians: smart computing and networking expert Gao Wen 高文 and computer vision and pattern recognition expert Zheng Nanning 郑南宁.

Those three experts also have leadership roles in the China AI Industry Alliance.

An AI Standardisation Technical Committee, set up by MIIT, has its secretariat located in the China Academy of Information and Communications Technology (CAICT), which also hosts the China AI Industry Alliance.

Besides the applied science experts, Beijing is advised by the National AI Governance Professional Committee, led by public policy scholar Xue Lan 薛澜 of Tsinghua University Institute for AI International Governance.

navigating chokepoints

general AI seen far off

In the US, there is widespread belief that AI is key to military and economic competition. Such beliefs are intensified by expectations that artificial 'general intelligence', capable of matching or exceeding humans, may be just years away.

PRC tech elites tend to be more sceptical about general intelligence. Zheng Nanning, who lectured the politburo in April, has in recent years argued that such technology is far off.

modelling limitations

Applying large AI models in high-precision and complex industries still entails formidable difficulties.

> **there is currently no way to eliminate large language models' hallucinations**

There is currently no way to eliminate large language models' hallucinations (factual errors), posing risks. Problems like 'catastrophic forgetting' (loss of prior knowledge during retraining) remain unresolved.

Large AI models are 'black boxes'. It is often hard to understand how they arrived at decisions. In high-stakes industries, this lack of transparency is a problem. People need to trust and verify the AI's reasoning. Large models may perform well on data they were trained on, but fail to adapt or generalise to slightly different real-world situations.

Current models struggle with ambiguity, contextual reasoning, and adaptability—essential for reliable performance in complex and variable environments of manufacturing and services.

Training and running models require enormous computational resources, raising costs and limiting how widely they can be used. Most models are reliant on vast quantities of cleaned and structured data, which can be hard to collect.

Within business, AI has made the biggest inroads by solving combinatorial optimisation problems, where the goal is to find the best combination or arrangement from a large set of possibilities, common in logistics, scheduling, manufacturing, and network design. For example, optimising delivery routes for hundreds of packages or scheduling machines in a factory to maximise efficiency are classic combinatorial tasks.

This reality has modified Beijing's industrial policy ambitions: the leap from labour-intensive manufacturing to a capital-intensive, high-tech economy powered by AI and robotics will take time.

While advanced AI prototypes—such as autonomous vehicles in designated zones—demonstrate what is possible, scaling these technologies in real-world environments remains elusive. The variability of physical settings, the need for constant maintenance and data updates, and the difficulty of achieving consistent reliability all constrain mass deployment.

As a result, many high-profile AI systems, such as autonomous cars and humanoid robots, are likely to remain stuck in pilot phases or limited geographies for a long time, far from economically viable at scale.

US restrictions

The US seeks to restrict PRC firms' access to its AI ecosystem. Leading US tech firms, above all OpenAI, have become cautious over open-source cooperation.

The US strategy comes from a belief that AI success primarily depends on 'scaling' or computing power. The US has a clear lead, accounting for 32 percent of the world's total computing power of 910 EFLOPS as of the end of 2024, compared to 26 percent in China, according to Chinese estimates.

A long list of PRC firms like Huawei, iFlytek and SenseTime, as well as Chinese AI research institutes, were added to US entity lists, curbing their access to technologies and partnerships.

The restrictions with most impact have been those on hardware, starting with controls on export of AI chips to the PRC in 2022, tightened several times since. Nvidia is the leader in the design of such hardware.

To prevent high-end chips leaking to the PRC from 'unreliable' third countries, the US divided the world into three zones: trusted partners, middle-tier countries, and restricted nations in late 2024. The Trump administration has said it will end that framework, but also banned Nvidia from shipping a chip it had designed specifically to comply with previous export rules.

The US focus on scaling is also based on Moore's Law, which predicts that the number of transistors on a chip doubles every 18–24 months.

Many warn that putting faith in Moore's Law may no longer make sense. As chipmaking becomes more expensive, it gets harder to make components smaller. The rule is losing its ability to predict progress. Business factors, pundits argue, like supply chain delays, the fact that only a few companies dominate chip production, and smaller returns on investment in

the latest technology, are becoming just as important as advances in engineering.

alternative PRC route and destination

Huawei is Beijing's main contender to replace the dominant player, Nvidia. Its Ascend AI chips, made by Shanghai foundry SMIC, are catching up, but still lag in performance.

PRC firms face serious challenges with computing power scheduling: allocating computing power across different uses, where US software has a lead.

PRC firms cannot rely on US-based hyperscalers like Microsoft and Amazon, which provide powerful elastic scheduling, auto-scaling, and orchestration tools. Domestic clouds (e.g., Alibaba, Baidu) lag behind.

Many AI labs still manually book GPU time, inefficient for industrial-scale AI. Chinese data centres, often running older or less capable GPUs, have to schedule carefully and ration usage.

That leaves PRC AI companies reliant on either export-compliant or previously stockpiled or new, lower-powered Nvidia chips in many contexts.

AI development in China has so far been built on NVIDIA hardware and its programming platform, CUDA, for over a decade. US export controls could restrict access to CUDA and developer support for blacklisted entities.

CUDA is also deeply integrated with other parts of the AI software 'stack' such as PyTorch, making it harder to design models on Huawei chips.

In early 2024, there was a sense of pessimism that China could work around the restrictions. Alibaba chairman Joe Tsai stated that PRC models were about two years behind their US rivals.

Deepseek undermined the belief that restrictions were Washington's ultimate lever. It showed it was possible to train advanced models without the need for massive amounts of high-end chips. Clever optimisation choices can level the playing field. In contrast to official prudence, DeepSeek's emergence gave a confidence boost to the Chinese economy and its tech market. The stock prices of Alibaba, Tencent and PDD Holdings rose significantly at the beginning of 2025.

Yet even after Deepseek, the debate on the impact of US restrictions is not settled, especially as they continue to tighten. In 2024, Deepseek Founder Liang Wenfang identified US controls as his biggest headache.

> **true computing strength lies not just in scale, but in efficiency, broad deployment of emerging technologies, and robust infrastructure**

According to Gao Wen 高文, academician at the Chinese Academy of Engineering and director of the Pengcheng Laboratory in Shenzhen, tasked by the NDRC with building the national integrated computing network, true computing strength lies not just in scale, but in efficiency, broad deployment of emerging technologies, and robust infrastructure. If so, the AI race hinges less on raw capacity and more on effective implementation.

Gao recently said that his team is building 16K PFLOPS of autonomous chip computing power to tackle the major technical challenges, like having faster data connections, and smarter ways to manage it. The ecosystem adopts Huawei's latest chip and is planned to be launched and used by the end of this year.

national computing network and data centres

Beijing aims to connect data centres nationwide and dynamically allocate computing tasks based on real-time demand, energy efficiency, cost, and geographic availability, similar to how a smart grid redistributes electricity.

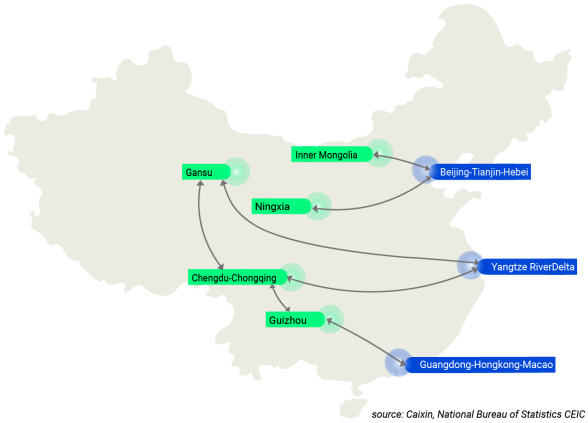
The project is being led by the three major state-owned telecom operators as 'chain chiefs'—China Telecom, China Unicom, and China Mobile. They are working alongside major cloud firms like Huawei to develop advanced scheduling algorithms.

Direct state support has been targeted geographically. From 2019–21, MoST organised 18 AI experimental zones to build infrastructure, demonstrate tech, and pilot policies. Of these zones, 11 have been co-designated by MIIT. Subsidies are provided for the development of dedicated operating systems, algorithms, and data computing and transmission infrastructure, such as 5G base stations, data and cloud computing centres.

Support is also given across geographies, led by the 'East Data, West Computing' (EDWC) initiative launched in early 2022: data generated in the economically dominant East is sent to data centres in the energy- and water-rich Western regions for processing.

By the end of June 2024, the eight major nodes of EDWC had reportedly invested C¥43.5 bn (US$6 bn), not a lot compared to the hundreds of billions of dollars invested in data centres in the US.

channelling computing resources from east to west



source: Caixin, National Bureau of Statistics CEIC

The initiative is best suited to applications that can tolerate delay in data transmission and processing and are not highly sensitive to latency. Training large AI models is a prime example because it requires huge datasets and long processing cycles, and benefits from lower-cost, high-performance computing resources in the West.

Beijing advanced the EDWC in 2023 to a National Integrated Computing Network. This expanded the scope of the original plan from eight core hubs to include all provinces and cities across the country.

It introduces a tiered model

- high-latency tasks like AI training continue to follow the 'East Data, West Computing' model—data is collected in the more populated eastern regions and processed in large data centres in the western regions, where land and energy are cheaper
- low-latency tasks like autonomous driving or financial transactions require real-time processing and are thus better handled locally
- for activities needing faster speeds, the policy proposes 'City Computing Network', localised in urban areas

Local government spending on data centres has stepped up, using 'special' local government bond issuance earmarked for 'new infrastructure'. When spending on infrastructure surged during the pandemic as a counter-cyclical tool, data centres were favoured.

As usual, local governments rushed to please Beijing, leading to much waste. While NDRC has a target of 60 percent utilisation in 2025, average computing power utilisation in PRC AI computing centres is below 30 percent, complained Yang Jianyu 杨剑宇 Zhejiang Mobile general manager and National People's Congress delegate, in March.

GPU rental prices have dropped to an all-time low. A recent report from the Chinese media outlet *Zhineng Yongxian* said that an Nvidia H100 server configured with eight GPUs now rents for C¥75,000 (US$10,000) per month, down from highs of around C¥180,000 (US$25,000).

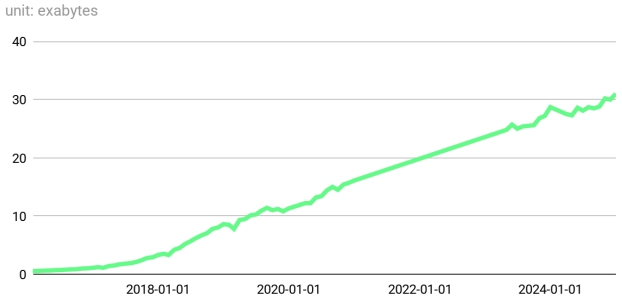
The national data infrastructure is still a work in progress. By 2024, over 58 percent of computing centres were connected to this national network. NDRC has suggested that the main structures, including distribution centres and data exchange markets, will be largely ready by 2029.

lots of data, but poor quality

With 1.2 billion people spending nearly seven hours a day online via mobile devices, China generates around eight billion hours of digital activity each day—more than all OECD countries combined. It also leads the world in industrial data output, not only due to the scale of its manufacturing base but also because of its high level of digital integration.

In addition, more than 600 cities across the country are equipped with smart infrastructure, creating a wealth of urban activity data as well.

PRC mobile internet traffic volume (by month)



source: MIIT

The problem is quality, formatting and accessibility. Zhao Hejuan 赵何娟, head of respected outlet TMT Media, warned in 2024 that much of PRC data is 'irrelevant or inaccessible'. For instance, weather data is badly organised and often not in computable formats.

> **the problem is quality, formatting and accessibility**

A growing data annotation sector that has reached 58,000 practitioners and is valued at over C¥8 bn (US$1 bn), according to the National Bureau of Statistics, will be key to turning the wealth of data into use. The medical, industrial, and educational industries have made 335 high-quality data sets.

The State Council declared data to be a 'factor of production' in 2020, alongside land, labour, capital and technology. Just as Beijing built markets for those

inputs since the 1990s, it has tried to do the same with data, with major cities setting up data exchanges. But take-up has been slow, with just C¥5 billion (US$700 million) of deals on Shanghai's exchange since it launched in 2021. The central government launched a 'national data bureau' in 2023 to speed up this effort.

limited deployment

China has been grappling with digitising its economy since it launched the 'internet plus' initiative in 2015. The program was rebranded as 'AI+' in 2024, expanding the ambition from widespread digitisation to widespread automation.

Eleven cities have been designated by MIIT to pilot and scale the real-world application of AI technologies:

national new generation AI innovation and application pilot zones

date	region	focus areas
2019	**Shanghai (Pudong New Area)**	Build a complete AI industry chain, create demonstration zones for intelligent manufacturing, smart cities, and AI governance, and develop an international AI innovation hub.
	Shenzhen	Promote AI industry clusters, expand application areas, build a collaborative ecosystem and service support system for AI innovation and application.
	Jinan-Qingdao (Shandong)	Focus on medical health, intelligent transportation, and smart city scenarios, aiming to improve AI industry competitiveness and application capabilities.
2021	**Beijing**	Strengthen the layout of AI core technologies, algorithms, and software and hardware systems; build an AI innovation highland; promote technological breakthroughs and their applications.
	Tianjin (Binhai New Area)	Focus on AI+ manufacturing, healthcare, and smart ports; foster collaboration in R&D, industrial applications, and talent cultivation.
	Hangzhou	Utilise advantages in digital economy and explore AI's application in government services, city governance, and digital industries. Build a new AI industry highland.
	Guangzhou	Strengthen support for AI public computing platforms and open innovation platforms, promote applications in healthcare, education, urban management, and transportation.
2022	**Chengdu**	Integrate AI with key industries like manufacturing, finance, and logistics. Strengthen core technology R&D and improve industrial chain competitiveness.
	Nanjing	Focus on enhancing AI basic capabilities and integrating with areas like intelligent manufacturing, healthcare, and city governance. Build an AI demonstration city.
	Wuhan	Strengthen foundational capabilities like algorithms, computing power, and data; focus on intelligent transportation, manufacturing, and energy.
	Changsha	Promote AI integration in equipment manufacturing, smart city, and intelligent agriculture. Develop a competitive AI industrial cluster.

manufacturing

Beijing talks about 'intelligent manufacturing': this includes digitisation, networked equipment and AI.

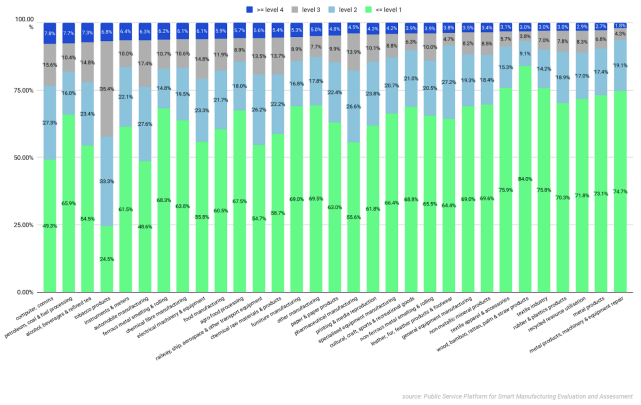
Digitisation means the use of computer-controlled machinery for greater precision than humans can achieve (something that has been ongoing since the 1950s), networked equipment allows for remote monitoring and control. Both these elements were part of Germany's Industry 4.0 strategy, which Beijing aimed to emulate with Made in China 2025.

The additional element, AI, should mean that machinery itself has the ability to learn and generate knowledge. Zhou Ji 周济, former Chinese Academy of Engineering president and key architect of PRC's manufacturing strategy, expects the relationship between machines and humans to change from 'giving a fish' to one of 'teaching how to fish'.

> **'smart manufacturing' at scale appears to be limited to facilities owned by the largest companies**

So far, 'smart manufacturing' at scale appears to be limited to facilities owned by the largest companies.

distribution of smart factories



To date, MIIT has approved 421 national-level smart manufacturing demonstration factories, with advanced AI and digital twins applied in most of them. The impact is tangible, with production times in sectors like new energy vehicles and high-speed trains having dropped by nearly 30 percent. Still, these pilot sites represent only a small fraction of over four million sizable PRC factories.

In late 2024, MIIT outlined 151 typical application cases where AI can be utilised to promote new industrialisation.

Current use-cases for AI in manufacturing include

- **production scheduling:** Lenovo's Hefei factory uses an AI model for production scheduling of small-batch orders, completing what was a six-hour daily task from multiple workers to minutes
- **inventory management:** Xiaomi uses an AI model at a mobile phone factory to analyse its supply chain and reduce excess inventory
- **assembly:** Xiaomi's car manufacturing plant reports that it has 700 AI-guided robots
- **quality control:** iFlytek reports its large model has a fault prediction accuracy of over 95 percent, while Dongfeng Motor's 3D digital twin system allows managers to virtually inspect the production line
- **predictive maintenance power use:** Nio's AI model analyses energy consumption patterns to recommend adjustments

Digitisation is a challenge as China's manufacturing sector is made up of six million companies, most of which are small or medium-sized, and more than 90 percent are in traditional sectors, rather than what the state designates as 'strategic and emerging industries'.

The slow pace of deployment in manufacturing is noted by the China Electronics Standardisation Institute, which has developed the China Manufacturing Maturity Model, which rates companies on a five-level scale, where level one refers to factories in the process of taking the first stage of digitisation, while level five refers to innovation leaders.

Of its surveyed companies by early 2025, roughly 6 percent have deployed level 4 or 5 intelligent manufacturing, while 58 percent are at level 1 or below.

The National Manufacturing Strategy Advisory Committee, chaired by Zhou Ji, has recommended focusing on larger companies in an action plan to promote intelligent manufacturing, 2024–27.

The goal is to see most 'major' factories reach a globally advanced level of intelligent manufacturing by 2035.

> **the goal is to see most 'major' factories reach a globally advanced level of intelligent manufacturing by 2035**

cars

Intelligent driving was one of the areas mentioned specifically in the 2017 AI plan. Digitising will become the primary competitive arena for innovation in the electric vehicle industry, overtaking batteries, charging stations and other hardware, contends Chen Qingtai 陈清泰 of the influential EV100. PRC competitive advantage lies not in auto firms, he argues, but in adjacent digital industries.

An action plan in 2018 supporting 'vehicle-road-cloud integration' set the PRC on a different path to its global competitors. The National Innovation Centre for Intelligent and Connected Vehicles in Beijing was set up to champion and develop it.

This means combining information collected by the self-driving car itself with information from cameras and sensors positioned around the urban environment: smart cars+smart roads. The approach is hoped to make cars both safer and cheaper, and plays to PRC's strength of having huge 5G network coverage. The system does not exclude vehicles with more onboard intelligence, which can be integrated and serve key functions themselves.

This smart city infrastructure is expensive, and is currently at C¥1–2 million (US$140,000–280,000) per kilometre. To cover the 5.4 million kilometres of roads across the country would cost C¥5–10 tn (US$700 bn-1.4 tn).

That limits rollout to the wealthiest cities, where local governments can afford to subsidise it. Since 2024, 20 cities have been piloting the model. They are building a low-latency and highly reliable networked cloud control infrastructure. The total investment, using special treasury bonds, is believed to reach C¥100 bn (US$13 bn) over two years, stimulating a vehicle-road-cloud industry worth C¥730 bn (US$100 bn) in 2025, according to the China Society of Automotive Engineers.

Baidu is a leader, with hundreds of driverless robotaxis rolled out in cities like Wuhan and Beijing, limited to areas with expensive roadside infrastructure.

Distancing themselves from the top-down China model, other firms bet on vehicle-based sensors. They include Pony.ai, which operates several hundred robotaxis in China.

PRC company Hesai Technology is a leader in the LiDAR sensors used in both vehicle-based and cloud approaches to autonomous driving. Huawei is following Tesla in pursuing a 'camera only' approach without reliance on LiDAR.

PRC firms have made advances in microchips for autonomous driving. Premier Li Qiang in 2023 visited Horizon Robotics, a national leader in the sector, which achieved a valuation of $6.7 billion in a 2024 IPO.

The PRC has since 2020 aimed at mass production of Level 3 autonomy for vehicles by 2025. But that goal is unlikely to be hit.

six levels of driving autonomy

		description	status
L0 no automation	human monitors driving environment	Human performs all driving tasks	
L1 driver assistance		single automated system, e.g. cruise control	
L2 partial automation		vehicle can perform steering and acceleration; requires human attention at all times	accounted for roughly half of new vehicles sold in 2024
L3 conditional automation	automated system monitors driving environment	can self-drive, but requires human intervention in severe conditions	goal: mass production by 2025
L4 high automation		can self-drive, even if human driver does not respond to request to intervene, the car can still pull over safely	16 cities have opened up for testing
L5 full automation		full automation without human attention under all roadway and environmental conditions	

Major PRC automakers claim to be close to launching L3 autonomous vehicles, but regulatory constraints are likely to slow that, after a fatal accident involving Xiaomi's SU7 sedan.

> **PRC automakers claim to be close to launching L3 autonomous vehicles, but regulatory constraints are likely to slow that**

Autonomous vehicles remain unable to perceive and interpret their surroundings reliably in rain, snow, fog, or at night, and they lack the ability to accurately predict the behaviour of other road users. As a result, these systems cannot reliably handle unusual or unexpected scenarios. Additionally, their vulnerability to cyber threats would need considerable defences against sensor tampering and malicious attacks.

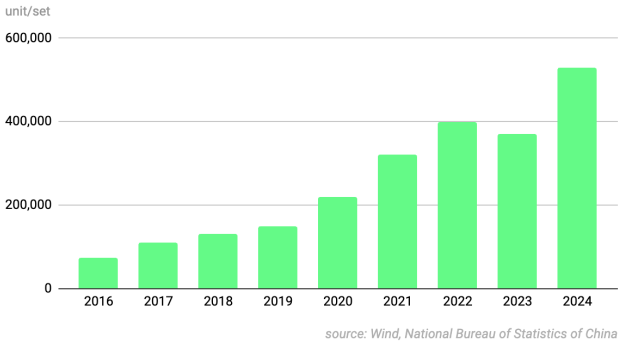
The MIIT in early 2025 prohibited automakers from using terms like 'smart driving' and 'autonomous driving' in advertisements for vehicles equipped with driving assistance features. Drivers remain the primary responsible parties.

robots

VC investment started to rush into humanoid robots in 2024, when PRC companies accounted for about half of fundraising in the sector worldwide, according to the Gaogong Industrial Institute. Embodied intelligence was mentioned as one of four 'future industries' in the 2025 PRC Government Work Report.

The large domestic robotics industry could be the foundation for the PRC to be a leader in the field.

annual production of industrial robots in PRC



source: Wind, National Bureau of Statistics of China

The goal is robots that can adapt to different physical forms and easily switch between tasks based on what is needed. This flexibility would replace human labour in a range of manufacturing and services, reshaping how smart factories are managed, and improving productivity and automation overall.

Unitree Technology's humanoid robots danced at CCTV's 2025 Spring Festival Gala, showcasing confidence in PRC progress. But such robots are still mainly sold to researchers as they lack the skills for commercial applications.

Industry insiders agree that humanoid robots are currently at an L2 level (basic functionality). The difficulty of transitioning from L2 to L3 (integration of hands, feet, mouth, eyes, and brain) is 'tenfold greater' for humanoid robots than for autonomous driving, notes He Xiaopeng 何小鹏 XPeng CEO. The L4 level needed for widespread adoption is even further away.

Currently, application scenarios are

- factory tasks like assembly, transport and inspection, which require long testing cycles (18–24 months)
- service-oriented roles (e.g., retail, healthcare, households) that face technical and regulatory hurdles

The PRC humanoid robot industry is overcrowded and will likely see consolidation, argued Cao Wei 曹巍 Lanchi Ventures partner, at the World Robot Conference held in Beijing in August 2024.

Lack of high-quality datasets needed to train humanoid robots is creating a bottleneck, notes Nie Kaixuan 聂凯旋 Songying Technology CEO.

Unlike textual data used for training language models, it is harder to build datasets for robots, since they face physical constraints and safety considerations.

Robots can currently perform specific, local, and repetitive tasks in well-defined environments. But they cannot yet handle complex, generalised manipulation or adapt flexibly to uncertain, dynamic real-world situations.

Similar challenges exist in the drone sector used for seeding, fertilisation, and delivery. Current commercial satellite data offer 0.3-meter resolution, and available stock geodata cannot meet the ambitions for a low-altitude economy. Demand for high-precision data, 3d modelling, and visualisation is set to rise.

Telecommunication is another hurdle: 5G networks cover only up to 150 meters, while low-altitude airspace extends to 1,000 meters. With 6G still years away, satellite internet is needed. PRC Starlink equivalents Qianfan and Guowang have launched about 100 satellites, far fewer than Starlink's 7,000.

healthcare

As early as 2015, AI medical imaging software companies (Infervision, DeepWise) began to emerge. Healthcare was listed in the 2017 plan.

Beijing issued regulations in 2018 requiring AI products that diagnose CT scans to obtain medical device licences. Alleviating pathology department pressure sees AI delivering value in hospitals.

At Shanghai Ruijin Hospital, around 6,000 pathological slides are produced daily, with each doctor reviewing an average of 200–300 slides per day. The hospital's Ruizhi Pathology large language model, jointly developed with Huawei, can pre-identify lesion areas, reducing diagnosis time per slide.

PRC firms have developed more than 100 large language models for diagnosis and other healthcare uses. Medical device company Mindray introduced the Qiyuan critical care large model, the world's first large language model applied to ICU critical care scenarios, piloted in two hospitals.

China's National Health Commission has listed 84 AI healthcare scenarios, and included AI-assisted diagnosis into the national healthcare pension plan to support widespread AI clinical use.

However, AI is categorised as an 'extension item', meaning AI cannot receive standalone reimbursement through medical insurance unless it is used together with medical hardware, limiting income.

On 15 January 2020, Keya Medical's coronary blood flow reserve calculation software became the first PRC Class III medical device (high risk, often implanted in the body) incorporating AI to be approved. More than 160 AI medical devices have received Class III registration certificates since then.

In February, nearly 100 hospitals across China announced deployments of DeepSeek in clinical decision-making, chronic disease management, medical record quality control, and telemedicine.

AI has the potential to equalise healthcare services across regions, but still carries significant safety risks and lacks a complete regulatory standard, warns Zhou Jifang 周吉芳 China Pharmaceutical University International Pharmaceutical Business School. With simple tasks replaced by AI, remaining healthcare workers will require advanced training to work with AI.

PRC pharma began to use AI for drug discovery in the late 2010s. Leading PRC firms like XtalPi sell services to overseas big pharma and domestic start-ups. The sector is still developing, with no AI-developed drug so far passing late-stage clinical trials.

> **no AI-developed drug so far passing late-stage clinical trials**

software

A major divide between the PRC and advanced economies is developing in the differing deployment of AI in software. In countries like the US, enterprise applications dominate.

In the PRC, the thrust of AI–software integration appears to be towards direct consumer uses delivered by mobile phone apps.

Bytedance's AI chatbot Doubao has 50+ million monthly active users (MAUs), according to Aicpb.com, with other chatbots claiming more than ten million.

Also emerging are AI agents, which leverage large models. Unlike chatbots that generate ideas or assist with specific workflows, they can independently perform tasks from start to finish. China's Manus AI is a leader in the field, but its performance has received mixed reviews.

Educational AI apps are also common. In December, the Ministry of Education released guidelines in AI education, stating the technology should be 'prevalent' in schools by 2030.