China's huge consumer market could drive the growth of 'embodied artificial intelligence', including AI-powered robots.

The AI race: how the Chinese and US approaches radically differ

The Deepseek chatbot has garnered attention, but China's real focus seems to be on embodied AI and industrial solutions, not consumer tools. **By Jacob Dreyer**

When US technology entrepreneur Peter Thiel's book *Zero to One* was published in Chinese in 2015, it struck at an insecurity felt by many in China. Thiel suggested that although the country excelled at scaling and commercializing emerging technologies, it lagged behind the United States in true innovation — creating something entirely original from scratch. Take the iPhone: engineers in Cupertino, California, design them; workers in Shenzhen, China, build them.

For more than a decade, Chinese policymakers have aimed to shed this image, embedding the pursuit of innovation into national industrial policies, such as Made in China 2025. And there are some early results to show. For instance, in 2023, the Shenzhen-based technology company Huawei launched the Mate 60 smartphone, which is powered by a domestically produced chip. This was celebrated as a symbolic breakthrough — demonstrating that China could manufacture advanced semiconductors despite stringent US sanctions on crucial tools and high-end design software. And last month's release of Deepseek-R1, a Chinese large language model developed at a fraction of the cost of its Western counterparts, sent shockwaves through the US tech establishment.

Prominent venture capitalist Marc Andreessen described it as "AI's Sputnik moment" — a reference to the mid-twentieth-century US–Soviet space race that began with the launch of the first satellite, Sputnik, by the Soviet Union. Accessing Deepseek through an application programming interface (API) — a protocol for connecting software applications — is roughly 13 times cheaper than similar models developed by OpenAI, based in San Francisco, California.

The sudden rise of Deepseek has put the spotlight on China's wider artificial intelligence (AI) ecosystem, which operates differently from Silicon Valley. Although consumer-facing applications garner much attention, Chinese AI firms, unlike their US counterparts, are in fact more invested in solving industrial and manufacturing problems at scale. The divergence in priorities reflects the forces driving innovation in each economy: venture capital in the United States and large-scale manufacturing enterprises and organs of the state in China.

Technology split

At the root of the difference is China's comparative advantage in the world economy — manufacturing — along with the government being

the largest client for new technologies. The Chinese government aims to develop low-cost, scalable AI applications that can modernize the rapidly developing country.

At a press conference last September, for example, Foreign Ministry spokesperson Lin Jian laid out the view of the Chinese Communist Party (CCP) that tech innovation is a core component of "national development". To stay in the good books of Beijing, AI research laboratories have responded by building practical applications – to make trains run on time, monitor fish stocks and provide automated telehealth services.

Beijing-based company Zhipu AI has partnered with several local governments and state-owned enterprises to deploy its agent model, which automates tasks such as form-filling and financial-report analysis. Last month, tech behemoth Alibaba, headquartered in Hangzhou, China, reached a deal with the Beijing-based startup 01.AI to set up an 'industrial large model laboratory' focused on deploying AI to optimize business and industrial processes.

AI also has an interesting role in China's energy transition, from large-scale trials of integrated smart homes to the roll-out of a major investment (equivalent to US$800 billion) for a national smart grid.

Thus, Beijing's goal is not necessarily to attain global leadership in AI chatbots, but to use the underlying technology to develop affordable, commercially viable business solutions. Its applications can then be exported, especially to lower-income countries. In other words, China's target is not necessarily 'frontier AI', but 'mass-market AI'. Its emerging AI playbook mirrors its approach to other technologies, such as electric vehicles and clean energy: not the first to innovate, but the first to make them affordable for widespread use.

Out of necessity

The technological 'stack', an interconnected set of resources needed to develop advanced AI models, includes hardware, such as semiconductors; cutting-edge learning algorithms optimized for that hardware; and a backend comprising energy-intensive data centres and predictable capital flows.

To maintain its global lead in AI technology, the United States has periodically imposed export sanctions on key components. On 7 October 2022, the administration of former US president Joe Biden released a set of export controls on advanced computing and semiconductor-manufacturing items, aiming to block China from purchasing high-performance chips from companies such as Nvidia, based in Santa Clara, California. Then-national-security-adviser Jake Sullivan called it the "small yard, high fence" strategy: the United States would erect a 'fence' around crucial AI technologies, encouraging even companies in

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Nvidia is a US company that manufactures chips needed to build AI systems.

allied countries, such as the Netherlands and South Korea, to restrict shipments to China.

Meanwhile, the CCP sees moving up the manufacturing supply chain, particularly into categories such as airplanes and semiconductors, as crucial for sustained economic growth. In that sense, the rivalry adds urgency and intensity to China's efforts. If the United States owns the technology of the future and is willing to use export controls, then China runs the risk of economic stagnation – and the political turbulence that might accompany it. The battle for supremacy over AI is part of this larger geopolitical matrix.

> ## "China's target is not necessarily 'frontier AI', but 'mass-market AI.'"

And China has been preparing for this scenario for a while. In 2019, the US added Huawei to its entity list, a trade-restriction list published by the Department of Commerce. This spurred China to rethink how to become less vulnerable to US export controls. The Chinese Ministry of Education (MOE) created a set of integrated research platforms (IRPs), a major institutional overhaul to help the country to catch up in key areas, including robotics, driverless cars and AI, that are vulnerable to US sanctions or export controls. There are now 30 IRPs.

Take the IRP for new-generation integrated circuit technology at Fudan University in Shanghai, China, for instance – the sort of state-driven research enterprise that could drive breakthroughs. The 2022 export restrictions targeted chips with 'nodes' – the

smallest component on a semiconductor – of 14 nanometres or less. Chips with smaller nodes can pack more transistors into the same area, potentially improving performance and efficiency. In 2021, the Fudan IRP was ahead of the curve, and already recruiting for roles to support research on even smaller nodes, of 3–4 nanometres. These high-performance chips now fuel the AI tech stack. To address manufacturing bottlenecks, the third round of China's 'Big Fund' – a state-backed investment initiative to pool in resources from public enterprises and local governments – was announced last year, with a planned US$47 billion investment in its semiconductor ecosystem.

This shows that China is serious about indigenizing AI capabilities by investing significant institutional, academic and scientific resources. By restricting access to chips, US policy has forced China to explore workarounds and unconventional methods. Many of these endeavours might fail. But it doesn't take many successes to make a global impact.

The IRPs have emerged as ideal platforms to train a cadre of engineers, filling a talent gap that existed even a decade ago. The Deepseek success story is, in part, a reflection of this years-long investment.

The road ahead

What direction might China's AI ecosystem take? Although the US might continue to have a chokehold over foundational chips for some time, China is arguably better prepared on other fronts: for instance, the rising need for power-hungry data centres. The National Integrated Computing Power Network, part of an infrastructure megaproject launched in 2021, plans to build expansive data centres in

western China, where land and electricity are cheaper.

China's unique economic and political ecosystem will steer AI development along certain pathways. The country is still grappling with developmental concerns, so universalizing health-care access, accurately predicting weather patterns and managing industrial logistics are higher-priority challenges than developing AI chatbots and digital companions — especially given the myriad compliance requirements around sensitive topics.

China's huge consumer market, coupled with its manufacturing base, could drive the growth of 'embodied AI', such as AI-powered robots, self-driving cars and industrial equipment. For example, when quadruped, dog-like robots made by the Hangzhou-based firm Unitree Robotics are deployed to repair infrastructure — navigating to specific checkpoints with high-resolution cameras and performing repairs using robotic arms — they receive laudatory coverage from Xinhua, the official state news agency.

"Software never really makes money [in China]; the population treats it as open source. Software coupled with hardware is where the profits are to be made," says a machine-learning researcher at Peking University in Beijing. "In that sense, robots enabled with AI might be the wave of China's future," they add.

In the language-model sphere, China's next push might be to identify a range of products it can export to other emerging economies. Benjamin Bratton, who researchers the philosophy of technology at the University of California, San Diego, says: "China can essentially provide the AI stack in a box. Here's your power plant; here's your foundational model; here's your stack architecture for application systems – here you go India, here you go Brazil."

To prepare for that possibility, China's government is already undertaking major policy reforms, revising its economic theory to include data as a resource equivalent to capital, labour and land. Currently, China is home to 36% of all large language models in existence, second only to the United States, according a white paper released last year by the China Academy of Information and Communications Technology, a state-backed research institute.

But as the United States and China race ahead of the rest of the world in AI development, the question of who is ahead or behind might become less relevant as their priorities diverge.

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Books in brief

Five Innovations That Changed Human History
Robin Derricourt *Cambridge Univ. Press* (2024)
Of all the human innovations that changed history, five captured the attention of historian Robin Derricourt: the taming of fire; the domestication of horses and their use for wheeled transportation; the creation of writing systems; the development of the printing press; and the invention of wireless communication. These innovations, he skilfully argues, stand out because "they separate in both time and community those who had the new skill or technology" from those who lacked it.

Waiting for Robots
Antonio A. Casilli *Univ. Chicago Press* (2025)
US founding father Thomas Jefferson used dumbwaiters — small lifts that carry meals — during his extravagant dinners. There seemed to be no human intervention, but the lifts were operated by enslaved basement staff. As sociologist Antonio Casilli acutely observes, today too, artificial-intelligence systems are made to seem automated, often by overlooked and underpaid workers. His thought-provoking survey of robots highlights "the presence of inconspicuous labour in AI solutions", hence its blunt subtitle, *the Hired Hands of Automation*.
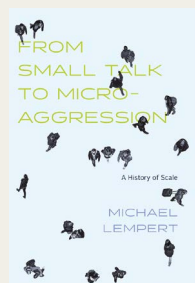
From Small Talk to Microaggression
Michael Lempert *Univ. Chicago Press* (2024)
As a doctoral student switching from Buddhist studies to social sciences, Michael Lempert pored over an interaction he had filmed of two Tibetan Buddhist monks "wrangling in speech and gesture" over philosophical points. He studied the minute-long video for nearly four months, sometimes muting the sound or watching it in fast forward. In his book, he examines the history of interaction from sociological, anthropological and linguistic perspectives across many subjects and scales — from small talk to microaggression.
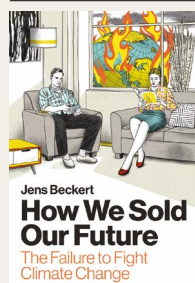
How We Sold Our Future
Jens Beckert *Polity* (2024)
After outlining the undisputed scientific evidence for global warming and future climate disasters, sociologist Jen Beckert asks: "If we know what to do and how to do it, why don't societies act?" He concludes that this is mainly because most nations are driven by capitalism, which resists environmental planning. Consumers are in "a conflictual relationship" with economics and politics, which both benefits and restricts them. He admits that his analysis is pessimistic, but he sees hope in society acting from the bottom up rather than the top down.
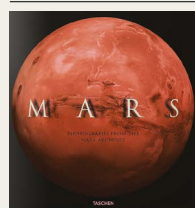
Mars
Nikki Giovanni *et al*. *Taschen* (2024)
Mars has long fascinated humankind, as this gloriously illustrated paean based on the NASA archives celebrates. In 1877, Italian astronomer Giovanni Schiaparelli observed *canali* — channels — on the planet's surface. Mistranslated as 'canals', the word famously launched a search for intelligent Martian life. In 2025, scientists hope to detect past microbial life in rocks collected by rover Perseverance. The book offers fine contributions by a poet, three space scientists and a historian of space exploration. **Andrew Robinson**