Issue Brief

具身智能

China's Embodied AI

A Path to AGI

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Executive Summary

This report examines China's embrace of embodied AI—artificial intelligence integrated with physical systems (robots, drones, vehicles, etc.)—as a critical pathway toward artificial general intelligence (AGI).

In the United States and Europe, large language models (LLMs) and their multimodal variants are regarded by many AI scientists and major AI companies as the most promising path to AGI, despite known issues with abstraction and reasoning.

By contrast, in China there is a broader vision of how AGI can be achieved, most recently expressed in a nationwide move toward AI embodiment—namely, intelligence developed through interaction between body, brain, and environment, in both physical and virtual forms.

This trend toward embodied AI is backed by policy support at the national and local government levels, which has led to large embodied AI innovation centers linked to top universities and tech firms being established in coastal cities and provinces.

The upshot is China is on a path to accomplish two goals simultaneously: enriching the nation by integrating AI into the economy and achieving AGI that is more aligned with the totality of human expression.

The report recommends that the United States and its allies ramp up their monitoring of China's AI progress, benchmark its claims, and consider broader approaches to AGI beyond scaling up LLMs.

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Introduction: AI Embodiment

Embedding or "embodying" (具身) artificial intelligence in agents that act in the physical world (or in digital simulations) is increasingly seen by Western[1] and Chinese[2] AI scientists as a promising successor to today's disembodied AI programs, which in essence are abstractions of abstractions. The logic is both simple and compelling.

Today's large language models and multimodal LLMs, such as ChatGPT, Google Gemini, and Anthropic's Claude, ingest vast quantities of data—text, images, video and audio—and analyze their relationships as a basis for answering queries, summarizing information, and translating languages.

The success of these models in the uses for which they are intended has encouraged their developers, and much of the AI community, to believe that more data and greater processing power will lead to the "holy grail" of artificial general intelligence (AGI), a hypothetical state in which the AI has the same cognitive abilities as a human. Other specialists argue that no number of enhancements to these statistical models will achieve human-level intelligence, especially if understood fully to include social, affective, and motivational intelligences.[3]

Meanwhile, the shortcomings of LLMs become evident as their popularity grows. They tend to "hallucinate" (provide false information or nonsense that appears plausible) while showing limited reasoning ability and severe deficits in generalizing, modeling time and space, managing ambiguous expressions, and grasping nuance.[4] These issues persist alongside the costs and environmental impacts associated with hosting and training LLMs.

Part of the problem is that these models are based on *depictions* of the world. They are derivative representations of reality, an imperfect amalgam of how people have imperfectly characterized things. While powerful, they have limitations. Human (level) intelligence, by contrast, is a product of brain-body-environmental interaction—a continuous, self-learning process grounded in reality and subject to its constraints. As one Google researcher succinctly put it, "In essence, environment and agent cannot be subtracted from the definition of intelligence."[5] Or as Max Riesenhuber, the co-director of Georgetown's Center for Neuroengineering, stated:

> "The problem is that, in LLMs, words (symbols) are not grounded in experiences of the real world, so any meaning of words needs to be inferred from the relations of words to each other, floating in some abstract space and being prone to misinterpretation, let alone hallucinations."[6]

The present paper investigates how top influential Chinese AI scientists and the PRC government approach the issue of AI embodiment, not just in terms of the practical benefits AI diffusion yields to society but also as a remedy for the limitations of large statistical models in the quest for AGI. In so doing, we follow the definition of embodied intelligence provided by Chinese researchers Lu Cewu (卢策吾) and Wang He (王鹤):[7]

> "Embodied intelligence refers to an intelligent system that perceives and acts based on the physical body. It obtains information, understands problems, makes decisions and takes actions through the interaction between the intelligent agent and the environment, thereby generating intelligent behavior and adaptability."

Another paper by Chinese AI scientists, echoes this description of the enterprise:[8]

> "Embodied Artificial Intelligence (AI) is an intelligent system paradigm for achieving Artificial General Intelligence (AGI), serving as the cornerstone for various applications and driving the evolution from cyberspace to physical systems."

Embodied AI, also called "physical AI," is a type of agentic AI that is "a class of artificial intelligence that focuses on autonomous systems that can make decisions and perform tasks with or without human intervention."[9] The main distinction between the embodied AI and agentic AI is that agentic AI is more commonly associated with action in virtual environments.[10] As we will see, the Chinese use "embodiment" to refer to both physical and virtual implementations.

"Agents" implementing embodied AI are robots, autonomous drones, self-driving automobiles, common household appliances, and in the limiting case, any physical substrate small or large,[11] such as the Chinese government's formal rollout of a "large social simulator" in Wuhan intended to realize AGI while "optimizing" production and social interaction.[12]

One example of embodied AI is a collection of AI-enabled factory robots on an automotive assembly line. Unlike current factory robots that are fixed in place and do a single task, these robots are mobile and can do a variety of tasks, say, building a sports car and then an SUV and then a light truck. They not only "know" what to do for whatever model is coming down the line, but they can easily recognize and adapt to changes, or move to different positions in the assembly line. All the while, they are collecting data on all the interactions they are having with physical objects as well as

humans, sharing all the data with each other (and a central AI "line director"), and learning and improving their own behaviors as they work.

Another example is the Xialan (夏澜) S02 humanoid robot, developed by the Shenzhen-based company Digit (数字华夏). Suitable for deployment in convention centers, office buildings, and malls, the robot is capable of multimodal perception,[13] has facial recognition capabilities, and reportedly recognizes emotions based on an in-house model that tracks lip movements. Xialan S02 can memorize an individual's age and where they were last seen. Users choose the LLM provider running Xialan S02 independently.[14]

All of these represent actual examples of embodied AI that China has developed or is pursuing. The theoretical advantages of embodied AI are:

- Being based on sensory inputs and real constraints, embodied agents are less prone to hallucinate.
- Learning while interacting with humans facilitates acquisition of emotional, motivational, and social intelligence.[15]
- Data available to AI-embodied agents is "limited" only by the size, complexity, and variety of the universe in which they operate.[16]
- As the embodied AI learns, it becomes more adept at manipulating the environment in an expanding, virtuous cycle.
- The evolving code can be shared among networked agents in real time, each sampling unique data, thereby shortening the path to AGI.[17]

The following Section 2 offers a chronology of policy announcements and events that showcase China's embrace of embodiment as a—perhaps *the*—next big phase of AI development.[18] In Section 3 we explore perspectives from Chinese scientists on the role of embodiment in AI and their efforts to define the project. Section 4 names the major centers where embodiment research is taking place as a prelude to Section 5, a bibliometric analysis of publications issued by these and other institutions. In Section 6 we offer recommendations for how the United States, Germany, and allied nations can meet this challenge. Data on China's conceptualization of AI embodiment and leading companies executing these projects are provided in the paper's two appendices.

Embodiment in Chinese AI Policy

"Embodied AI" (具身人工智能) as a complement or alternative to large AI models has been backed by China's state and municipal governments since at least 2023.[19] It is now fully part of China's AI mainstream, as shown in the following timeline of events.

May 30, 2023: The Beijing city government, within whose jurisdiction much of China's AGI research takes place,[20] issued "Several Measures for Promoting the Innovation and Development of General Artificial Intelligence in Beijing."[21] Under "exploring new paths," the notice named "general agents, embodied intelligence, and brain-like intelligence" and called for promoting "research and application of embodied intelligent systems."

July 7, 2023: "Embodiment" was first acknowledged as a major theme of Chinese AI research at the World Artificial Intelligence Conference (世界人工智能大会) hosted by the Shanghai Qi Zhi Institute (上海期智研究院).[22] The institute bears the name of its founder, Turing Award laureate Yao Qizhi (姚期智, a.k.a. Andrew Chi-Chih Yao), who claimed "embodied AGI is the next step of large language models."[23]

November 2, 2023: The Beijing Humanoid Robot Innovation Center (北京人形机器人创新中心) was established,[24] and was subsequently upgraded to the National and Local Co-constructed Embodied Intelligent Robot Innovation Center (国家地方共建具身智能机器人创新中心) in October 2024. The center has both a general robotic platform and "intelligent body" platform made up of an embodied brain (the AI software) for "task planning driven by AI large models."[25]

November 3, 2023: China's Ministry of Industry and Information Technology (MIIT) elaborated on its "Guiding Opinion on the Innovation and Development of Humanoid Robots" (人形机器人创新发展指导意见).[26] Under "What key technologies should we focus on breaking through?," it states: "First, develop a humanoid robot 'brain' based on large artificial intelligence models to enhance environmental perception, behavioral control, and human-machine interaction."

March 30, 2024: The 1st China Embodied AI Conference (中国具身智能大会) convened in Shanghai, sponsored by the Chinese Association for Artificial Intelligence's (中国人工智能学会, CAAI) "Embodied Intelligence Professional Committee" (具身智能专业委员会), and attended by a host of Chinese AI luminaries (see Appendix 1 for more details).[27]

Box 1. Embodied AI as a framework for AGI[28]

"Embodied AI represents a crucial step towards achieving Artificial General Intelligence (AGI). The next paradigm of Embodied AI involves physical embodiment, enhanced perception capabilities, and adaptive automation. This advances the field significantly, paving the way for broader expansion."

April 27, 2024: Beijing's Haidian District government made public a three-year (2024-2026) plan to facilitate research in embodied AI. The plan defines "embodiment" as "the ability of an intelligent system or machine to interact with [physical and virtual] environments in real time through perception and interaction" and is meant to serve as a platform for nationwide (全国) development.[29] In February 2025, the district launched China's first "embodied intelligence innovation industrial park."[30]

July 31, 2024: MIIT released its "2024 Project Application Guidelines for 16 Key Projects."[31] Item 4 on "Intelligent Robot Key Projects" has multiple references to "embodied intelligence" applied to exploration of unknown environments, and transferring intelligence from artificial circuits to "life-intrinsic closed loops" (生命本征闭环)," i.e., feedback mechanisms for adaptation and self-regulation, etc.[32]

October 25, 2024: China's National Library of Standards (国家标准馆) issued "Embodied Intelligence: A Guide to Grading the Stages of Intelligent Development." The notice reads in part, "This document mainly defines the grading standards for embodied intelligence... It aims to provide a systematic framework covering the progress of embodied intelligence in perception, cognition, decision-making, autonomy and generalization." [33] Its final "G5" stage is AGI.

December 18, 2024: The Beijing Economic-Technological Development Area Administrative Committee (北京经济技术开发区管理委员会), located in Beijing E-Town (北京亦庄), issued an "Action Plan for Building a World-Class Embodied Intelligent Robot Industrial New City in Beijing Economic-Technological Development Area (2024–2026)."[34] Among other propositions, the plan aims at a "full-chain layout and full-stack autonomy" for embodied AI robots by 2030.

January 20, 2025: An "Interdisciplinary Strategic Seminar on Embodied Intelligence" was held in Hong Kong, supported by the National Natural Science Foundation of China (NSFC) and attended by prominent AI figures. Topics covered embodied perception and cognition, ontological issues, and control of embodied AI. The keynote

speech highlighted the "self-evolution" (自我进化) of embodied systems through interaction with the physical world.[35]

January 24, 2025: The NSFC issued "2025 Project Guidelines for Major Research Programs on Explainable, Generalizable Next-Generation AI" to "explore humanlike cognitive learning; improve system intelligence through the active perception and interaction of intelligent agents, autonomous learning, and iterative updating of models; and solve the interactive decision-making problems of embodied intelligent agents in complex physical environments."[36]

February 28, 2025: Beijing Municipality released a "Beijing Embodied Intelligent Technology Innovation and Industry Cultivation Action Plan (2025–2027)." The plan calls for developing over 100 key technologies, producing internationally leading products, deploying some 10,000 embodied intelligent robots, and cultivating an industrial cluster worth 100 billion yuan ($13.8 billion). The goal is to "lead the frontier of embodied intelligence" via:

- breakthroughs in multimodal fusion sensing technology
- developing a large model of an embodied intelligent "brain"
- improving the ability of the embodied intelligent "cerebellum" skill model[37]
- improving robot motion control performance, and
- developing domestic high-performance embodied smart chips.[38]

March 5, 2025: At the Third Session of China's 14th National People's Congress, Premier Li Qiang (李强) unveiled the 2025 Government Work Report (政府工作报告), which included for the first time embodied intelligence and intelligent robots among a handful of technologies selected for development.[39] Follow-up reporting indicated some ten provinces and municipalities had written "embodied intelligence, robots, or intelligent robots" into their local government work reports.[40]

March 29, 2025: The "2nd China Embodied AI Conference," held this time in Beijing, issued the "Chinese Association for Artificial Intelligence Embodied Intelligence White Paper" representing China's first effort to "sort out a development roadmap of embodied intelligent technology."[41] An "Embodied Intelligence Collaborative Innovation Matrix" was also activated. Attendees concluded that embodied intelligence is "an important technical path to achieve AGI."[42]

April 21, 2025: The Shanghai Municipal Commission of Economy and Information Technology launched its "2025 New Generation AGI Innovation Tasks." Item 1 calls for building "an embodied intelligence training computing infrastructure centered around autonomous operations in real-world scenarios, heterogeneous humanoid robots,

high-quality embodied intelligence datasets, and embodied intelligence model libraries." [43]

August 6, 2025: Shanghai Municipality issued an "Action Plan for the Development of the Embodied Intelligence Industry 2025–2028" aimed at making "algorithmic and technological breakthroughs in embodied models," fostering a local concentration of related industries, and building "internationally leading products."[44] Research priorities are perception, decision making, and motion control.

October 23, 2025: Embodied intelligence was included along with brain-computer interfaces and a handful of other advanced technologies as targets for accelerated development at the Fourth Plenum of the 20th Central Committee of the Chinese Communist Party (中国共产党第二十届中央委员会第四次全体会议), underscoring its importance in central leadership planning.[45]

What we see looking across these official announcements and events is the following:

- A growing number of formal announcements from the Chinese central and municipal government bodies prioritizing research on AI embodiment.
- An increasing series of academic engagements on embodied AI confirming that the field is getting growing attention from Chinese researchers.
- The establishment of dedicated institutes and centers showing that significant resources are being committed to these research endeavors.
- The setting of standards to facilitate progress, ensure diverse efforts are synchronized, and set the foundations for transition to actual applications.
- Actual plans for industrial applications.

Collectively these depict a sustained national effort by China that is moving quickly from research to actual real-world applications in a manner consistent with other examples of PRC-driven efforts to accelerate technology from research to full production.

China's Concept of Embodiment

China's embrace and understanding of embodied AI is also evidenced in public statements by the country's top AI scientists. The following is a sample:

HUANG Tiejun (黄铁军) founded the Beijing Academy of Artificial Intelligence (北京智源人工智能研究院, BAAI) and is vice dean of Peking University's Institute for Artificial Intelligence. Huang names three paths to AGI: "information models" based on big data and big compute, embodied models, and brain emulation.[46] Huang believes AGI can be achieved by integrating large models with the physical world.[47]

LIU Yang (刘阳) et al. in a "Comprehensive Survey on Embodied AI" point out that "embodied artificial intelligence is crucial for achieving artificial general intelligence (AGI) and serves as a foundation for various applications,"[48] underscoring a point made by the present study's authors about the compatibility of the two goals.[49] Liu et al. identify "four main targets" of embodied AI: perception, interaction, agentive, and sim-to-real adaptation.

LIU Yunhao (刘云浩), Tsinghua University, is the author of a recent, comprehensive volume on embodied AI.[50] Liu argues, "We have reason to believe that in the near future, embodied agents will have the ability to perform general tasks and strong learning capabilities. They will be able to understand our world more deeply and participate in it in unprecedented ways."

LU Cewu (卢策吾), Shanghai Jiao Tong University, and **WANG He** (王鹤), Peking University, stated, "In recent years, the academic research frontier of artificial intelligence has gradually shifted from 'Internet AI' driven by static big data to 'embodied AI' centered on the interaction between intelligent agents and the environment." In their view, this lack of physical interaction in large-scale models "has become a bottleneck on the path to AGI."[51]

PU Muming (蒲慕明, a.k.a. Mu-ming Poo), Chinese Academy of Sciences (CAS) academician who heads a major neuroscience consortium, asserts, "An LLM is a piece of software. It is only when that software is integrated into a physical system that it can truly interact with the environment. I believe that humanoid robots with high-level embodied AI will be the most active field in the next 5 to 10 years.... The LLM can serve as the brain of the robot."[52]

TAN Tieniu (谭铁牛), CAS academician at the 2025 Interdisciplinary Strategic Seminar of Embodied Intelligence, stated his belief that "embodied intelligence represents a new frontier in interdisciplinary research and a strategic high ground for the

development of intelligent technology."[53] He later claimed that embodied intelligence is "the only way for the sustainable development of artificial intelligence."[54]

WANG Yequan (王业全), Beijing Academy of Artificial Intelligence, and Sun Aixin (孙爱欣), NTU Singapore, in a paper titled "Toward Embodied AGI: A Review of Embodied AI and the Road Ahead," claim, "It is widely recognized that embodied AI is either an essential pathway to achieving AGI—reflecting the indispensable role of the human body in cognition —or should even form part of AGI's definition itself."[55]

WU Zhaohui (吴朝晖), CAS academician and former vice minister of China's science ministry, stated, "Natural language big models represented by ChatGPT are not the final form of AI big models. More advanced than it is multimodal embodied intelligence."[56] Wu believes China must "explore the development of AGI in multiple ways," including "embodied intelligence, distributed group intelligence, human-machine hybrid intelligence, and enhanced intelligence.[57]

ZHANG Bo (张钹), CAS academician and Tsinghua professor, in an article titled "Embodied Intelligence Drives the Realization of AGI" wrote, "Human intelligent behavior not only relies on the brain's thinking, but also needs to learn and make decisions through interaction with the physical environment... The idea of embodied intelligence, unlike traditional artificial intelligence, will push artificial intelligence to a higher level—artificial general intelligence.[58]

ZHANG Yaqin (张亚勤, a.k.a. Ya-Qin Zhang) co-founder of Microsoft Research Asia and dean of Tsinghua's Institute for AI Industry Research, cites three problems with LLMs: low computational efficiency, inability to "truly understand the physical world," and tokenization. Zhang believes that "we need to explore how to combine large generative probabilistic models with existing 'first principles' [of the physical world] or real models and knowledge graphs."[59]

These endorsements by AI scientists reflect a broad consensus about the role of embodiment in China's AI development program in *principle*. What specifically do they care about? How is the discipline conceptualized?

Liu Yang et al.'s "Comprehensive Survey" (see above) identifies four classes of embodiment across the physical and virtual worlds, with examples as follows:[60]

- Robots—fixed, mobile, biomimetic.
- Simulators—digital replicas of a physical environment.[61]
- Perception—visual language navigation, 3D visual grounding.
- Interaction—question answering, grasping.

Box 2. Alibaba Group CEO on the future of AI[62]

> "As AI permeates more physical scenarios and understands more physical data, we believe the capabilities of AI models and agents will continue to grow.... Future models will continuously interact with the real world, acquiring new data and receiving real-time feedback.... After countless scenarios executed and feedback loops with real-world results, AI will self-iterate to achieve intelligence capabilities that surpass humans, and an early-stage ASI AI system will emerge."

The "2nd China Embodied AI Conference" (Section 2 above) in its "Chinese Association for Artificial Intelligence Embodied Intelligence White Paper" (中国人工智能学会具身智能白皮书) goes on to identify 15 key areas:[63]

- multimodal embodied perception (多模态具身感知)
- embodied autonomous learning (具身自主学习)
- embodied large models (具身大模型)
- embodied world model construction (具身世界模型构建)
- embodied operation (具身操作)
- embodied navigation and path planning (具身导航与路径规划)
- embodied human-machine collaboration (具身人机协同)
- swarm embodied intelligence (群体具身智能)
- embodied knowledge inference (具身知识推理)
- embodied intelligent simulation platform (具身智能仿真平台)
- migration and generalization of embodied intelligent simulation to real environments (具身智能仿真到真实环境的迁移与泛化)
- embodied intelligence safety and security (具身智能安全)
- embodied dialogue and interaction (具身对话与交互)
- embodied reinforcement learning and adaptive control (具身强化学习与自适应控制)
- embodied consciousness and emotion (具身意识与情感)

Other indications of where things are headed are found in government-issued "action plans." Here are the "key tasks" listed in Beijing's "Industry Cultivation" plan:[64]

1. Lead the frontier of embodied intelligence software and hardware technology.

- Make breakthroughs in multimodal fusion sensing technology.
- Develop a large model of an embodied intelligent "brain."

- Improve the ability of the embodied intelligent “cerebellum” skill model.
- Improve robot motion control performance.
- Strengthen technological innovation and supply capabilities of core components.
- Develop domestic high-performance embodied smart chips.

2. Accelerate the construction of new research and innovation platforms.

- Build an embodied intelligent world model simulation platform.
- Jointly build a high-quality multimodal universal embodied data collection platform.
- Build a pilot verification platform for embodied intelligent robots.
- Build an open testing platform for real scenarios.

3. Promote a multi-scenario demonstration application of embodied intelligence.

- Expand the scale of scientific research and education implementation.
- Accelerate the large-scale implementation of industrial and commercial scenarios.
- Prospectively explore personalized application services.

4. Optimize the embodied intelligent industry ecology.

- Build a full-stack talent echelon.
- Carry out high-level open cooperation.
- Strengthen enterprise gradient cultivation services.
- Create an embodied intelligent industry cluster.

Finally, a detailed sense of what Chinese specialists regard as embodied AI’s salient features can be gleaned from the names of the panels into which the 2024 and 2025 China Embodied AI Conferences were divided, listed below in Appendix A.

These expert statements, ontologies, and state plans reflect a comprehensive approach to AI embodiment that satisfies China’s two goals of practical AI implementations and a plausible path to AGI. The following sections explore the research and academic infrastructures that “ground” these projections in reality.

Major Chinese Research Centers

The following is a list of top Chinese research centers "embodying" AI, in the robotics field especially. Embodied AI "innovation centers" (创新中心) first appeared in 2023 in Beijing and Shanghai and are taking root in other Chinese cities.

Beijing — The National and Local Co-constructed Embodied Intelligent Robot Innovation Center was founded in 2023 and upgraded to a state-sponsored entity in 2024 (see Section 2 above). Major companies driving the hub are Xiaomi (小米), Beijing Jingcheng Machinery Electric Holding Co., Ltd. (北京京城机电控股有限责任公司), and Ubtech Robotics (优必选).[65] The key focus areas of the Beijing center are standards setting, policy advising, and regulations. Besides developing the robotic and embodied intelligent platforms Tiangong (天工) and Huisi Kaiwu (慧思开物), the center also assembled a large standardized universal embodied intelligence dataset, RoboMIND.[66] This innovation allows for cross-platform compatibility and deploying one brain on multiple machines.[67] Beijing also hosts a National Robot Standardization Technical Committee (全国机器人标准化技术委员会).[68]

Shanghai — The Shanghai Foundation Model Innovation Center (上海 "模速空间" 创新生态社区) in Xuhui District (徐汇区) aims to become the "world's largest artificial intelligence incubator," a place where disembodied AI "brains" and physical embodiment meet.[69] As of April 2025, the center hosted some 255 LLM companies.[70] The city also plays host to a Shanghai National and Local Co-constructed Humanoid Robotics Innovation Center (上海国家地方共建人形机器人创新中心), which like its Beijing counterpart was established in 2023 and upgraded to a national center in 2024. The center has an embodied AI simulation platform—Ge Wu (格物)—designed for robot development, which can train 100 different kinds of robots with a single codebase. Its goal is to collect 10 million physical data entries by the end of 2025.[71] The center is located within the Zhangjiang Robot Valley (张江机器人谷), whose goals include building a "three brain integration" (三脑融合) system made up of a "cerebellum" (小脑) for motor control, a "cerebral" (大脑) component for decision-making, and "cloud-brain swarm intelligence" (云脑集群智能).[72]

Ningbo and Hangzhou — By 2024, Ningbo hosted 50 robotics companies with a total output of 8 billion yuan (USD 1.12 billion).[73] Its Zhejiang Humanoid Robot Innovation Center Co., Ltd. (浙江人形机器人创新中心有限公司) was launched in March 2024 by the city government and Zhejiang University.[74] The center has a "universal embodied intelligent humanoid robot" called NAVIAI-i2 capable of 0.1 mm precision and humanoid navigation.[75] The university also operates the Haichuang Humanoid Robot Innovation Center (海创人形机器人创新中心), a robotics integrator.[76]

Shenzhen — The city hosts several embodied AI "innovation centers," making it a major AI robotics hub. The Guangdong Embodied Intelligent Robotics Innovation Center (广东省具身智能机器人创新中心) was launched in April 2024 to merge AI and robotics.[77] In November 2024 the Huawei (Shenzhen) Global Embodied AI Industry Innovation Center (华为（深圳）全球具身智能产业创新中心) opened, aimed at creating an embodied AI "ecosystem" in Shenzhen's Bao'an district.[78] Huawei followed in July 2025 with its Cloud Embodied Intelligence Industry Joint Innovation Center (华为云具身智能产业联合创新中心), also in Bao'an,[79] hosting some nine companies, including a Singularity Factory (奇点工厂).[80] In March 2025, the Humanoid Robotics Innovation Center of the Guangdong Academy of Sciences (广东省科学院人形机器人创新中心) was established to manufacture human-like robots.[81]

Hefei — The city, a major hub for China's military-civil fusion strategy, harbors some 150 embodied intelligence companies and a number of centers.[82] The latter include the Jianghuai Advanced Technology Center (江淮前沿技术协同创新中心), made up of three institutes focused on intelligent robots, components, and evaluation.[83] Its goal is to develop autonomous robots supported by "intelligent cerebrums" (智慧大脑) and "agile cerebellums" (敏捷小脑). The Jianghuai Center released its Qijiang-2 humanoid robot in late 2024, able to make autonomous decisions and build on an embodied framework for multimodal interaction.[84] Meanwhile, iFLYTEK (科大讯飞), the University of Science and Technology of China's Institute of Advanced Technology (中国科学技术大学先进技术研究院), and other entities established an Anhui Humanoid Robot Industry Innovation Center (安徽省人形机器人产业创新中心) in 2024 to improve brain (cerebrum) and cerebellum technologies and multimodal sensory fusion.[85]

Nanjing — The Nanjing Embodied Intelligent Robot Application Center (南京具身智能机器人应用中心) launched in the city's Software Valley (软件谷) in March 2025,[86] led by Huaxia Robot Nanjing (华夏机器人南京), a leading producer of humanoid robots and subsidiary of Digit (see Introduction). The center's niche is large-scale data collection for embodied intelligence.[87] The city also hosts the Jiangsu Embodied Intelligent Robot Innovation Center Co., Ltd. (江苏具身智能机器人创新中心有限公司).[88]

Wuhan — In March 2025, HEC (东阳光), Shanghai AgiBot Innovation Technology Co., Ltd. (上海智元新创技术有限公司, also called Zhiyuan Robotics [智元机器人]), and the Wuhan East Lake High-tech Development Zone (武汉东湖新技术开发区, also known as China Optics Valley [中国光谷]) created what will be "China's largest embodied intelligent robot data collection center" (全国规模最大的具身智能机器人数据采集中心).[89] By June 2025, a Hubei Humanoid Robot Innovation Center (湖北人形机器人创新中心) was fully operational in Optics Valley.[90] Wuhan is also the starting point for

China's effort to build a nationwide "social simulator" based on embodied AI, to "optimize" most aspects of human interaction.[91]

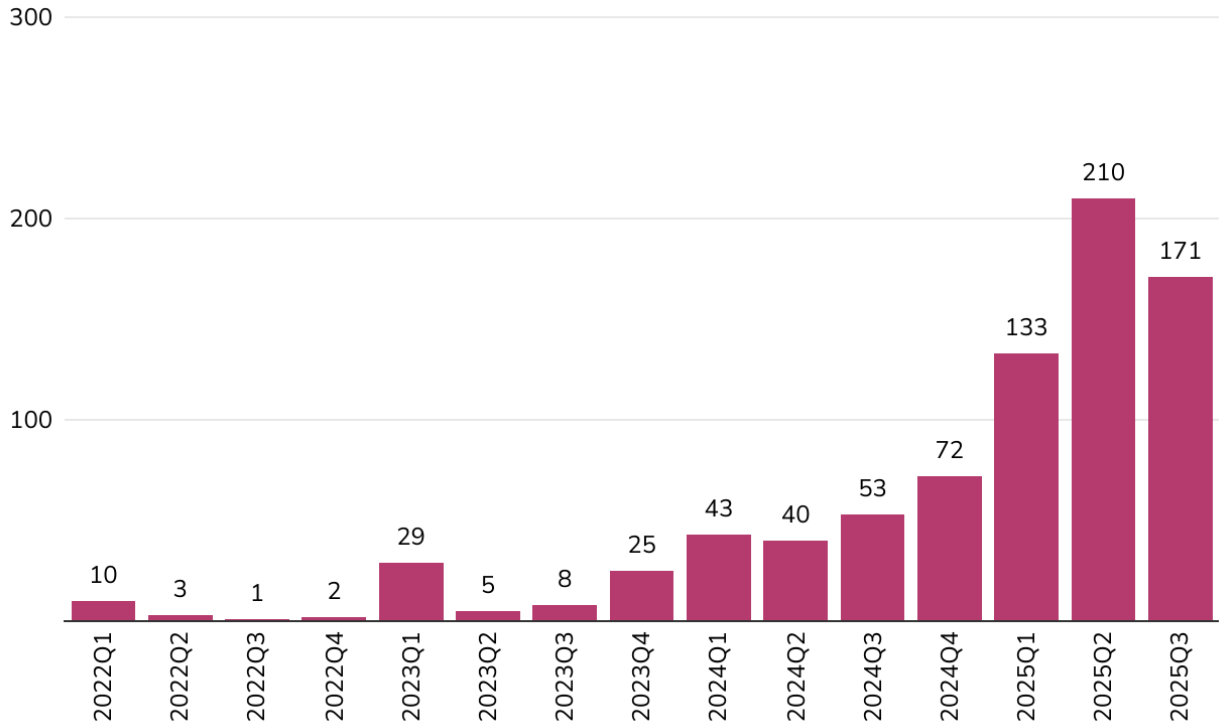
Chengdu — The Chengdu Humanoid Robot Innovation Center (成都人形机器人创新中心) was founded in April 2024, the first of its kind in western China.[92] Its "Raydiculous-1" humanoid emulation is powered by a series of small models for perception and execution that allow for on-device reasoning, in contrast to single end-to-end models (vision-language-action), which require heavy cloud computing.[93] In line with its emphasis on achieving more with less, it released China's first lightweight humanoid robot Konka-1 (贡嘎一号), weighing 25 kg, in October 2024.[94] A Sichuan Robot Brain Innovation Center (四川机器人大脑创新中心) was opened there on September 28, 2024.[95]

Embodied AI research in robotics and other applications has its roots in China's major eastern metropolises and is carrying through to provincial hubs as the meme gains momentum. A similar transition is observed in China's academic writings, discussed below.

The Academic Dimension

Additional evidence of the focus on embodied AI comes from the academic literature. Figure 1 (below) plots the number of papers by PRC-affiliated scholars found in CSET's Merged Corpus and the CNKI database[96] from January 2022 to September 2025.[97]

Figure 1. China-affiliated embodied AI publications — 2022 to 2025



The figure shows a temporary rise in the number of embodied AI papers published in Q1 2023, which coincides with the appearance of embodied AI centers in Beijing and Shanghai. The subsequent quarter evinces the start of a continuous rise in publication volume, spiking in Q2 2025 as the theme moved into the broader AI mainstream.

The following table lists the top dozen China-based institutions producing these embodied AI papers.[98]

Table 1. Top 12 China-affiliated institutions

Affiliation	Papers	Location
Tsinghua University	43	Beijing
Peking University	26	Beijing
Chinese Academy of Sciences	15	Beijing
Zhejiang University	17	Hangzhou
Beijing University of Aeronautics and Astronautics*	16	Beijing
Shanghai Jiao Tong University	15	Shanghai
University of Science and Technology of China	15	Hefei
Beijing Institute of Technology*	13	Beijing
Tongji University	13	Shanghai
China Unicom	11	Beijing
Sun Yat-sen University	8	Guangzhou
University of Chinese Academy of Sciences	7	Beijing

(* indicates “Seven Sons” universities with ties to the PLA)

These institutions are all located in areas identified by other Chinese sources (above) as foci of embodied AI development. Nine of the 12 institutions are in Beijing or

Shanghai, which are also the main hubs for China's AGI[99] and brain-inspired AI[100] research.

Beijing's standout role in China's embodied AI ecosystem can be traced back to 1988, when China's State Key Laboratory of Intelligent Technology and Systems (智能技术与系统国家重点实验室) was launched at Tsinghua University, "planting the first seeds for embodied intelligence in China." By 2025, Tsinghua alumni had helped found 18 embodied AI companies, earning for the university its informal title as the "Whampoa Military Academy" of Chinese embodied intelligence.[101]

Tsinghua University's contribution to this sector of China's AI development is mirrored by its position at the top of Table 1. At the end of 2024, the Beijing Municipal Science and Technology Commission and Zhongguancun Administrative Committee invested five Beijing-based institutes with embodied intelligence "key laboratory" status, including Tsinghua, the Chinese Academy of Sciences, Beijing University of Aeronautics and Astronautics, Beijing University of Technology, and Beijing Jiaotong University.[102] The city's Haidian District alone hosts 297 embodied intelligence companies.[103]

Chinese higher education's embrace of "embodied intelligence" is further evidenced in recently announced plans by eight top universities to offer a major in the discipline, including Beijing University of Aeronautics and Astronautics, Nanjing University of Aeronautics and Astronautics, Beijing Institute of Technology, Beijing University of Posts and Telecommunications, Northeastern University, Shanghai Jiao Tong University, Zhejiang University, and Xi'an Jiaotong University.[104]

The appearance of China Unicom—a Chinese state-owned telecommunications enterprise—is an anomaly as it is the only Chinese "company" among the top 25 contributors to the embodied AI academic literature (top 12 shown in Table 1), the remainder all being universities. A quote from Qin Yang (秦洋), Unicom's deputy general manager, explains, "Our 5G-A networks currently serve users, and we're upgrading them to support embodied AI as well."[105] Unicom's work in embodied AI was also referenced by company director Chen Zhongyue (陈忠岳), who stated that Unicom will promote the "integrated development of embodied intelligence and humanoid robots (具身智能、人形机器人融合发展)."[106]

The acceptance of "embodied AI" as a major theme by Chinese AI scientists, institutional support and guidance by China's national and local governments, the diffusion of embodied AI centers in the capital area and throughout China, and the rapid expansion of dedicated companies are indications of how seriously China takes

this approach. The scope of research named in government “action plans” and professional forums, endorsements by top Chinese scientists with world-class reputations, and China’s expressed intent to integrate “embodiment” with emerging trends in AI and neuroscience[107] suggest a level of dedication and expertise that is on track to deliver game-changing commercial applications and advances in AI’s capabilities overall.

Recommendations

AI practitioners, pundits, and policymakers in the United States and Europe debate the benefits, costs, and dangers of AI development, motivated by the headlong rush of U.S. companies toward artificial general intelligence (AGI). Embraced by some as humankind's salvation,[108] others predict AGI will lead to mass unemployment, loss of control, accidents—or human extinction.[109] Still others see AGI, presently conceived, as dubious in principle and a waste of resources.[110]

These debates occur against the backdrop of China's own AI development and are influenced by it. U.S. advocates of stepped-up AGI research point to China's private and state-backed programs as a challenge needing a response in kind. Others cite China's lead in commercial applications as a sign that U.S. companies' single-minded investment in AGI-oriented models is misguided.[111] In our opinion, both arguments miss the point.

As shown in this study, influential Chinese AI scientists and policymakers see no contradiction between practical AI applications and the pursuit of AGI as national goals.[112] Indeed, a chorus of China's top AI scientists believe that embodying AI in the physical world is the best and, perhaps, only way to get there. In China's view, it's not a case of backing one approach or the other—the one *entails* the other and resides in the concept.[113]

By the same token, arguments for engaging in an "AGI race" typically conflate winning with pumping ever-expanding resources into large AI models and their infrastructures, while leaving other potential AGI venues, including those founded in neuroscience, to fend for themselves. As we have demonstrated, here and elsewhere, Chinese government and research institutions are investing in *multiple approaches* to AGI and appreciate that insights in one venue can catalyze others.[114]

Underlying this analysis is the assumption that we understand what is really happening in China. Forays into the open literature by a few language-capable analysts, punctuated by goodwill visits to China, offer a fractional view of China's AI progress. While China's momentum in embodied AI is undeniable, challenges remain in ascertaining Chinese success in transferring capabilities from simulation to real-world environments,[115] and in determining how much of this embodied AI research will accelerate AGI development—or simply lead to greater functionality for robots and other applications—since embodiment per se will not lead automatically to AGI.[116]

What's needed is a broad monitoring effort—modeled, perhaps, on China's own prodigious efforts to mine data on foreign technology[117]—that can digest the terabytes

of information needed to grasp China's AI developments in detail, compare China's work with efforts outside China, and benchmark the country's claimed achievements to avoid being led down blind alleys.

China's AI progress challenges all nations in equal measure. While the value of global AI safety coalitions is widely accepted, allied collaboration in monitoring China's AI progress as a basis for engagement and mitigation should also be promptly pursued.

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Appendices

Embodied AI Conference Panels

Panels from the First China Conference on Embodied Intelligence (CEAI 2024)[118]

- Embodied Multimodal Large Models (具身多模态大模型)
- Intelligent System Perception and Decision-making (智能系统感知与决策)
- Intelligent Sensing and Control Collaborative Technology (智能感控协同技术)
- Large Models and Intelligent Systems (大模型与智能系统)
- Multimodal Interaction and Virtual-real Migration: Exploring Cutting-edge Technologies in Embodied Intelligence (多模态交互与虚实迁移: 具身智能前沿技术探索)
- Multimodal Learning and Embodied Intelligence (多模态学习与具身只能)
- Universal Movement and Universal Operation of Robots (机器人通用移动与通用操作)
- Embodied Intelligence—The Future of Intelligent Vehicles (具身智能—智能汽车的未来)
- Embodied Intelligence Driven by Both Knowledge and Data (知识和数据双轮驱动的具身智能)
- General Embodied Intelligence in Real and Virtual Open Worlds (真实与虚拟开放世界中的通用具身智能)
- Embodied Intelligence and Medical AI (具身智能与医疗 AI)
- Embodied Touch (具身触觉)
- Intelligent Perception and Interaction for Open Environments (面向开放环境的智能感知与交互)
- The Past, Present, and Future of Humanoid Robots (人形机器人的过去, 现在与未来)

Panels from the 2nd China Conference on Embodied Intelligence (CEAI 2025)[119]

- Embodied Large Models (具身大模型)
- Embodied Touch (具身触觉)
- Urban Embodied Intelligence (城市具身智能)
- Innovation Through Integration of Embodied Intelligence and Robotics (具身智能与机器人技术融合创新)
- Trusted Embodied Visual Computing (可信具身视觉计算)
- Embodied Operation and Continuous Learning (具身操作与持续学习)
- Discussing the Blueprint for Embodied Intelligent Data (共话具身智能数据蓝图)
- Embodied Agent Vision-Language Navigation (具身智能体视觉语言导航)

- Pattern Recognition and Robotics (模式识别与机器人)
- General Embodied Intelligence in Real and Virtual Open Worlds (真实与虚拟开放世界中的通用具身智能)
- Automotive Embodied Intelligence Technology (汽车具身智能技术)
- Bio-Inspired Embodied Intelligent Robots (生物启发的具身智能机器人)
- Generative AI and Embodied Intelligence (生成式 AI 与具身智能)
- Humanoid Robots (人形机器人)
- Embodied Intelligence in Unstructured Environments (非结构化环境具身智能)
- Security of Embodied Intelligent Systems (具身智能系统安全)
- Deep Space Exploration Embodied Intelligence (深空探测具身智能)
- World Models (世界模型)

Selected Chinese Embodied AI Companies

Huawei (华为), Shenzhen. It aims to transform any physical entity into "an embodied intelligent agent."[120] Huawei developed the CloudRobo embodied intelligence platform, which provides services such as "data synthesis, annotation, model development, simulation testing, edge-cloud deployment, and security governance"[121]

Hubei Optics Valley Dongzhi Embodied Intelligence Technology Co., Ltd. (湖北光谷东智具身智能技术有限公司), Wuhan.[122] In July 2025, Optics Valley Dongzhi launched "Photon 光子," a large model-powered humanoid robot meant to advance the development of a universal foundation model of embodied intelligence.[123]

Shanghai National and Local Co-constructed Humanoid Robotics Innovation Center, Shanghai. It released the world's first generative humanoid robot motion large model Longyue (龙跃, MindLoongGPT) at the end of May 2025. Longyue is able to generate "high-fidelity motion actions from multimodal inputs…enabling more flexible and natural robot movements…."[124]

iFLYTEK (科大讯飞), Hefei. iFLYTEK has invested into the LindenBot (安徽聆动通用机器人科技有限公司) start-up.[125] LindenBot's goal is to use iFLYTEK's Spark LLM and to fuse embodied LLMs and robotics.[126] In August 2025, LindenBot stated that it received a third round of financing worth several hundred million yuan.[127]

UBTECH Robotics (优必选科技), Shenzhen. UBTECH uses the embodied intelligent body platform Huisi Kaiwu (慧思开物, see Section 4—Beijing) to deploy a collective brain network called BrainNet (群脑网络), which allows humanoid robots to engage in swarm intelligence.[128] BrainNet partly integrates DeepSeek-R1 technology.[129]

AgiBot/Zhiyuan Robotics (智元机器人), Shanghai. The AgiBot Data Collection Megafactory (数据采集超级工厂) harbors over 100 human-operated robots.[130] The company announced the first universal embodied foundation model in China AgiBot GO-1 (Genie-Operator-1) in March 2025.[131] AgiBot open-sourced AgiBot World, the first large-scale robotic learning dataset.[132]

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