CHINA

Promoting the Artificial Intelligence for Science approach

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Key takeaways:

- The government in China is supporting the integration of AI across different fields of science through programs and infrastructure.
- China is active on the international front regarding AI technologies and has achieved the development of platforms and software supporting AI.

Artificial Intelligence for Science (AI4S) is an emerging mode that integrates AI and scientific research. It refers to the use of AI technologies and methods to learn about, simulate, predict and optimize various phenomena and laws in nature and human society. This case study focuses on the example of AI4S in China, exploring the impact of machine learning and AI on the scientific system.

The Chinese government attaches great importance to AI4S, promoting innovations in AI algorithms and models oriented towards major scientific problems. They have established open platforms in typical research areas of AI4S, encouraged academic institutions to open their data resources and set norms for ethical conduct with AI4S. At the national and local government levels in China, policy initiatives in the field of AI4S are mainly as follows.

Special research programs and infrastructure

In March 2023, the Ministry of Science and Technology, in collaboration with the National Natural Science Foundation of China, launched a special initiative called the Implementation Plan for Scientific Research Driven by Artificial Intelligence (2022–2025) to support the adoption of AI tools in basic sciences such as mathematics, physics, chemistry and astronomy. The intention is to address major challenges such as climate change, the energy transition, drug development, genetic research, biological breeding and new materials. The projects include cross integration of AI and materials science, cross integration of AI and basic mathematics, cross integration of AI and information technology, cross integration of AI and life sciences, and cross integration of AI and ethical and social issues (Ministry of Science and Technology, 2023a).

Meanwhile, the Ministry of Science and Technology is leveraging the national project Science and Technology Innovation 2030 – Next Generation of Artificial Intelligence (Ministry of Science and Technology, 2021) as a driver to build open intelligent computing power infrastructure, facilitate the active opening of data resources from various sectors, and generate policy synergy to advance AI4S. In April 2023, the Shanghai government supported Shanghai Jiao Tong University in launching the Open Platform of AI4S with Open-Sourced Models and Scientific Data (Jiefang Daily, 2023).

Ethics governance and regulations

In 2017, the Chinese national plan for developing AI was released (State Council, 2017), in which it is pointed out that AI has both technical and social features. Two committees were established by the Chinese government to implement the plan: a technical committee and a governance committee. The governance committee is composed of relevant experts from universities, research institutes and enterprises. It has released documents such as *Governance Principles of the Next Generation of AI – Developing Responsible AI* (National Next Generation AI Governance Professional Committee, 2019) and *Next Generation Artificial Intelligence Ethics Standards* (National Next Generation AI Governance Professional Committee, 2021).

In 2021, the Chinese government also established the National Science and Technology Ethics Committee, which has released a list of high-risk AI research and development areas (Ministry of Science and Technology, 2023b). This ethics committee has a subcommittee dedicated to AI, consisting of experts from relevant sectors and providing professional consultations to the State Council for the formulation of China's technology ethics policies. Finally, in 2023, after a month-long online open consultation, the State Cyberspace Administration of China along with multiple departments jointly issued *Interim Measures for the Management of Generative Artificial Intelligence Services*, marking the first regulatory policy for China's AI-generated content industry (The Cyberspace Administration of China, 2023a).

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Brain computer interface (BCI) technology has also been included in the scope of AI ethical governance in China. In February 2024, the Artificial Intelligence Ethics Subcommittee under the National Science and Technology Ethics Committee, developed the "Ethical Guidelines for Brain Computer Interface Research". It emphasizes that research on brain computer interfaces should be conducted in accordance with relevant Chinese laws and regulations, internationally recognized ethical standards, as well as professional consensus and technical specifications reached by the scientific communities (National Science and Technology Ethics Committee, 2023).

In September 2024, the Research Ethics Committee of China Academy of Science released a document entitled 'Reminder on Integrity in the Standardized Use of Artificial Intelligence Technology in Scientific Research', which clearly states that the committee opposes the implicit use of AI for the following: the generation of unverified research reports, references lists, research proposals, literature review papers, peer review comments etc.; the use of AI generated data, audio, video and graphics as experimentally observed ones; the abuse of AI technology that endangers data security, infringes on intellectual property rights, and leaks personal privacy. The committee prohibits uploading review information to AI platforms that have not been approved by the review organizers. Additionally, wherever AI is used in scientific research, it is required that the name, version, date and usage process of the AI tool be declared [10].

The international perspective

China has an open and proactive attitude towards international cooperation in AI. It supports the United Nations' irreplaceable role in international AI governance, and actively participates in activities organized by bodies such as the United Nations Educational, Scientific and Cultural Organization (UNESCO), International Telecommunication Union (ITU), World Health Organization (WHO), United Nations Industrial Development Organization (UNIDO) and United Nations Development Programme (UNDP). China has invited United Nations bodies' representatives to join relevant AI conferences and forums in the country.

In November 2023, the Chinese government launched the Global Initiative on AI Governance, outlining eleven proposals that prioritize a people-centric approach and respect for the sovereignty of other countries. It was emphasized that China is willing to engage in communication, exchange and cooperation with all parties on global AI governance, promote the benefits of AI technology to all mankind, and propose constructive solutions to the development and governance issues of AI that are of wide concern to all parties in the new era (The Cyberspace Administration of China, 2023b).

China's promotion of non-governmental exchanges and cooperation is exemplified in the August 2023 International Young Scientist Salon 'AI for Science – Taking Place in the Current Scientific and Technological Revolution', organized by the China Association for Science and Technology in Shanghai. Young scientists from eight countries including the United Kingdom, Greece and Germany participated in the discussion and exchange (CAST, 2023) . Shanghai also hosted the January 2024 World Digital Education Conference, jointly organized by the Chinese Ministry of Education, the National Committee of UNESCO and the Shanghai Government. This conference focused on the theme of 'Digital Education: Application, Sharing, and Innovation', with subthemes of enhancing teacher digital literacy and competence; digitizing education and building a learning society; evaluating global trends and indices in digital education development; AI and digital ethics; challenges and opportunities of digital transformation for basic education; and digital governance in education (Ministry of Education, 2024).

Overall development trend

Based on relevant research reports and literature review (AI for Science Institute of Beijing, 2023), the overall trend in the field of AI4S in China can be summarized as follows.

Chinese academic institutions, universities and leading AI enterprises are proactive in the AI4S field, with internationally influential achievements such as MEGA-Protein, Pengcheng Shen Nong, Shanghai AI Lab's FengWu and PanGu Weather (Fang, X., et al., 2022) (K. Bi,et al., 2023) . Abundant open scientific research data resources have accumulated for AI4S, with open-source data found in meteorology, astronomy and high-energy physics (Tan, S. *et al.,* 2023).

A considerable number of AI4S algorithms and foundational software have also emerged, including Huawei's MindSpore Science, Baidu's PaddleScience, DP Technology's DeePMD and Zhipuai's GLM, providing rich datasets, foundational models and specialized tools for AI4S research (Huawei, 2017). AI4S applications are being explored in various fields including life science, material science, energy science, electronic engineering and computer science, earth and environmental science, and industrial simulation. In particular, institutions represented by the likes of Baidu and Huawei are actively promoting the development of AI4S industrial practice.

Foundational Artificial Intelligence for Science software

Baidu's PaddlePaddle began planning technical forms and product routes in the AI4S field as early as 2019. It has since released the biological computing platform PaddleHelix, the quantum computing platform PaddleQuantum, and the scientific computing platform PaddleScience. Baidu has collaborated on exemplary projects with multiple universities and research institutions and launched the PaddlePaddle AI4S CoCreation Program to build an ecological business opportunity. In May 2023, Baidu published a paper in the journal Nature opening up numerous possibilities for the integration of AI into fields such as biology and healthcare (Fang, X., et al., 2022).

Huawei, meanwhile, has launched PanGu large models for drug molecules, meteorology and ocean waves. Among them, the PanGu drug molecule large model can improve the screening speed of small molecule compounds, greatly improve research and development efficiency, and explore more possible combinations of molecular elements at lower costs. In July 2023, the research results of the PanGu meteorological large model of Huawei Cloud were published in the journal Nature, and it is the first AI model to surpass traditional numerical forecasting methods in accuracy (K. Bi,et al., 2023).

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