ScienceOne 100: A platform-based innovation engine for AI for Science launched by the Chinese Academy of Sciences

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A new round of global technological revolution is accelerating at an unprecedented pace. The transformation of research paradigms catalyzed by Artificial Intelligence for Science (AI4Science) is fundamentally redefining the innovation landscape, research efficiency, and development quality. On April 28, the Chinese Academy of Sciences (CAS) officially released the ScienceOne 100 model system in Beijing. This launch marks a pivotal milestone in AI-empowered scientific research, signaling a transition from fragmented and closed "single-point explorations" toward a new stage of collaborative and efficient "platform-based innovation" (Figure 1).

BUILDING AN AI4SCIENCE INNOVATION MATRIX

In the era of artificial intelligence, CAS is leveraging its strengths in multidisciplinary integration, systematic organization, and mission-oriented research. By bringing together dozens of research institutes, CAS aims to move AI4Science from single-point exploration toward platform-based innovation. The ScienceOne 100 model system represents a landmark outcome

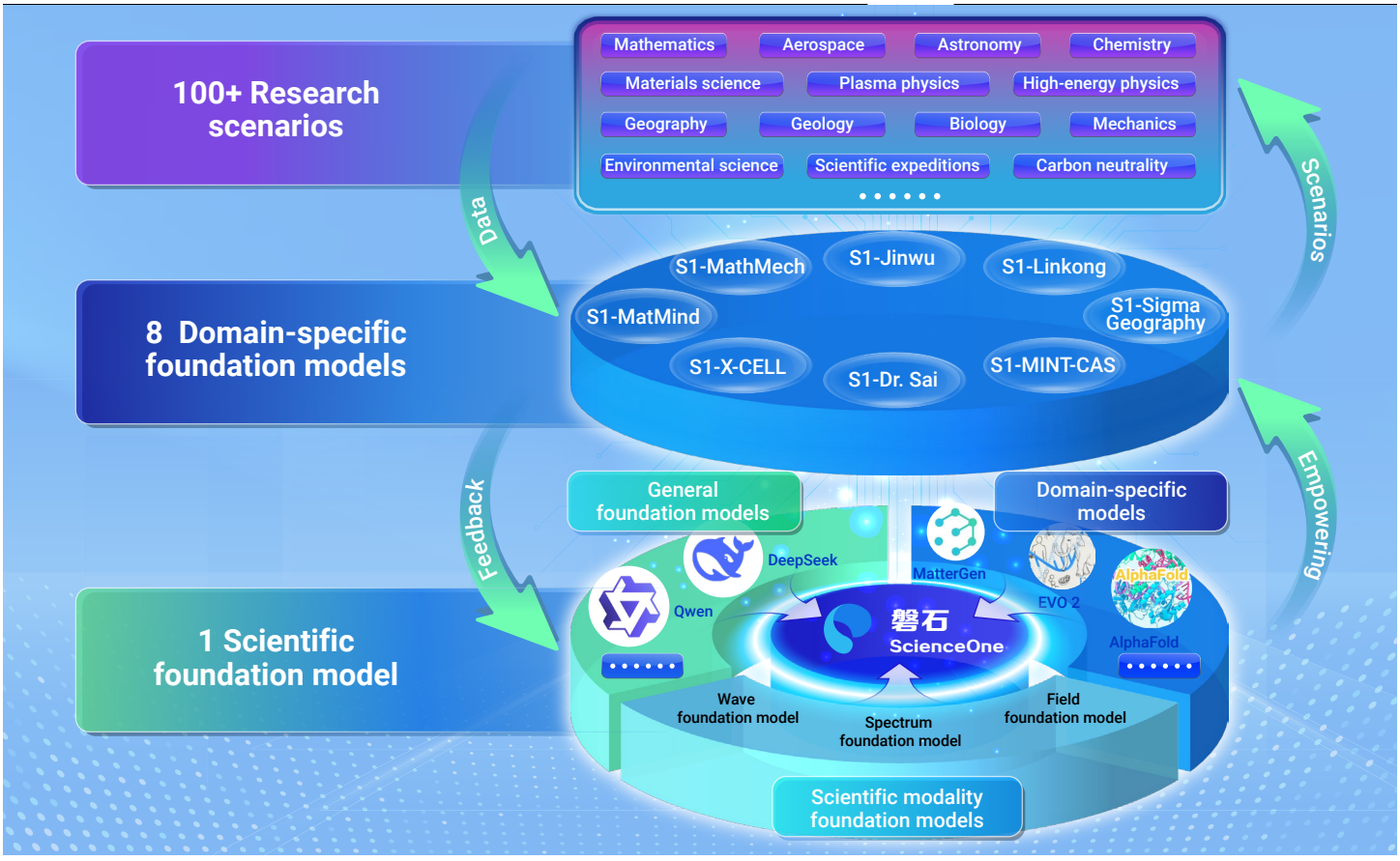

Figure 1. The framework of the ScienceOne 100 model system.

of this strategic layout.

The ScienceOne 100 model system is built on the ScienceOne scientific foundation model as its foundation, supported by a cluster of domain-specific foundation models as its backbone, and extended through application models and agents for specialized research scenarios. Together, these components form a comprehensive, highly interconnected platform for scientific innovation.

THE ScienceOne SCIENTIFIC FOUNDATION MODEL

The ScienceOne scientific foundation model (S1-Base) is an intelligent foundation for scientific research, trained on professional scientific corpora and data. It provides core capabilities in scientific literature extraction and aggregation, scientific knowledge representation and reasoning, and scientific tool orchestration and planning, with the aim of offering robust and reliable intelligent support for scientific innovation across disciplines. Built on 6.5 million high-quality scientific reasoning data entries independently constructed by the team, S1-Base has achieved a leap forward in scientific knowledge reasoning, multimodal understanding and generation, and reliability. It has reached flagship-model performance on benchmarks for scientific knowledge question answering and long-horizon agentic reasoning, and has achieved state-of-the-art results in multiple evaluations related to scientific image understanding and manipulation.

S1-Base incorporates three scientific modality foundation models for wave, spectrum, and field data. For wave-data, S1-Base targets time-series and oscillatory signals such as electromagnetic waves, seismic waves, vibration waves, and gravitational waves. It has developed a wave foundation model

that supports cross-scenario transfer, helping identify latent structures and patterns from complex waveforms and driving astronomical event observation from retrospective analysis toward early warning. For spectrum-data, S1-Base accurately infer component composition, material structure, and physical properties from six types of spectral signals, including X-ray diffraction spectra, infrared spectra, and Raman spectra. It demonstrates significant effectiveness in application scenarios such as chemical materials and biomedicine. For field-data, S1-Base focuses on spatial and temporal simulation of physical fields such as velocity fields and pressure fields. It has developed a field foundation model for industrial analysis, which is expected to bring industrial fluid simulation into a minute-level rapid-response stage and enable a high-throughput R&D model in which design and simulation proceed in parallel.

As a foundation platform, S1-base provides three core functions: literature compass (S1-Literature), proposal evaluation (S1-Deepeval), and agent factory (S1-AgentFactory), empowering the full process of scientific innovation. S1-Literature supports researchers in conducting deep literature analysis and generating review articles automatically. It tracks frontier breakthroughs, extracts research plans, organizes technological methods, and integrates research findings, substantially improving research efficiency. S1-Deepeval perceives frontier trends in science and industry, extract key technical indicators, and assess innovation potential and application value. It helps researchers efficiently identify key scientific questions and potential innovation directions, while supporting research management departments in conducting in-depth and objective evaluations of scientific innovation and technical proposals. S1-AgentFactory provides an integrated "tools and agents" service, realizing autonomous toolchains construction and agent generation. It has already accumulated more than 2,000 scientific tools and supports more than 10 specialized research fields.

EMPOWERING EIGHT SCIENTIFIC DOMAINS FOR FRONTIER BREAKTHROUGHS

With the scientific foundation model as its intelligent base, CAS has integrated AI-ready data resources and formulated AI-ready scientific problems across key disciplines, including mathematics, physics, materials science, astronomy, environmental science, aerospace science, earth science, and life science. This effort is building a cluster of domain-specific scientific models and forming a systematic innovation ecosystem for AI-empowered scientific discovery.

In mathematics, S1- MathMech overcomes key bottlenecks in mathematical reasoning and computation, delivering order-of-magnitude advances in theorem proving and partial differential equation solving. These breakthroughs provide powerful support for large-scale, high-precision simulations of complex fluid dynamics and other long-standing scientific computing challenges.

In physics, S1-Dr. Sai strengthens capabilities throughout the particle physics analysis pipeline and improves research efficiency. Already applied in large scale scientific facilities such as the Beijing Spectrometer (BESIII) Experiment, it is expected to reshape the way particle physics exploration is conducted.

In materials science, S1-MatMind enables on-demand design and precision synthesis, significantly improving the efficiency of new materials development and establishing a new R&D paradigm that integrates knowledge discovery with materials design.

In astronomy, S1-Jinwu is built on an independently developed, high-quality, AI-ready data foundation. It enables intelligent solar flare prediction and automated research, driving a paradigm shift in solar activity forecasting and research.

In environmental science, S1-MINT-CAS is the first panoramic carbon emissions accounting system covering production, consumption, and natural sources. It has enabled the initial development of high-precision, country-level carbon holographic maps, providing precise support for national strategies to address climate change.

In aerospace, S1-Linkong delivers a holistic mastery of near-space technology, spanning environments, aerodynamics, thermal performance, and flight control. By assisting researchers in identifying key technical pathways, it represents the first domain-specific near-space model with both deep domain cognition and complex reasoning capabilities.

In geography, S1-Sigma Geography is a comprehensive intelligence ecosystem, integrating task reasoning, tool orchestration, and multi-model collaboration to address real-world demands. Empowered by this system, researchers have successfully mapped global soil inorganic carbon dynamics and characterized the spatial distribution of plateau landforms.

In life science, S1-X-Cell identified three previously unknown drug targets within 30 days, all of which were validated through wet-lab experiments. The model is also advancing immunotherapy prognosis for oncology, paving the way for highly individualized, precision treatment regimens.

DEPLOYED IN OVER 100 SCENARIOS TO EMPOWER FRONTLINE RESEARCH

The ScienceOne-100 model system has already been deployed across more than 50 CAS institutions, covering over 100 scientific research scenarios. It has demonstrated strong potential in a wide range of applications, including high-speed rail flow-field reconstruction, spectral recognition, materials discovery, adjuvant design, astronomical observation, Plateau scientific expeditions, ocean forecasting, and ecological research. These deployments show how ScienceOne is moving beyond model development to support real-world scientific innovation at the research front line.

Leveraging CAS's comprehensive strengths in the natural sciences, its full-stack artificial intelligence innovation chain, and major scientific infrastructure, ScienceOne aims to build a new ecosystem for AI-empowered scientific research. It will accelerate cross-disciplinary innovation and work with the broader research community to explore the vast potential of AI4Science.

DECLARATION OF INTERESTS

The author declares no competing interests.