



Computing Center, IHEP, CAS
National HEP Data Center

AI Roadmap at IHEP

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Computing Center, Institute of High Energy Physics

17th Workshop of the

FCPPN/L

France-China Particle Physics Network and Laboratory

Lyon, France • 29 June – 3 July 2026



Outline

- 01 Background
- 02 Roadmap & Tasks
- 03 AI Infrastructure
- 04 Summary & Outlook

Large Science Facilities

Join in EP, SVOM...

enhanced X-ray Timing and Polarimetry mission (eXTP)

Insight Hard X-ray Modulation Telescope (HXMT)

Gravitational wave Electromagnetic Counterpart All-sky Monitor (GECAM)

Huairou Campus
High Energy Photon Source (HEPS)

IHEP, Beijing Campus
Beijing Electron-Positron Collider (BEPC)

Jinan Branch

YBJ International Cosmic Ray Observatory (retirement)

Ali CMB Polarization Telescope (AliCPT-1)

Large High-Altitude Air Shower Observatory (LHAASO)

Daya Bay Neutrino Experiment (Daya Bay) (retirement)

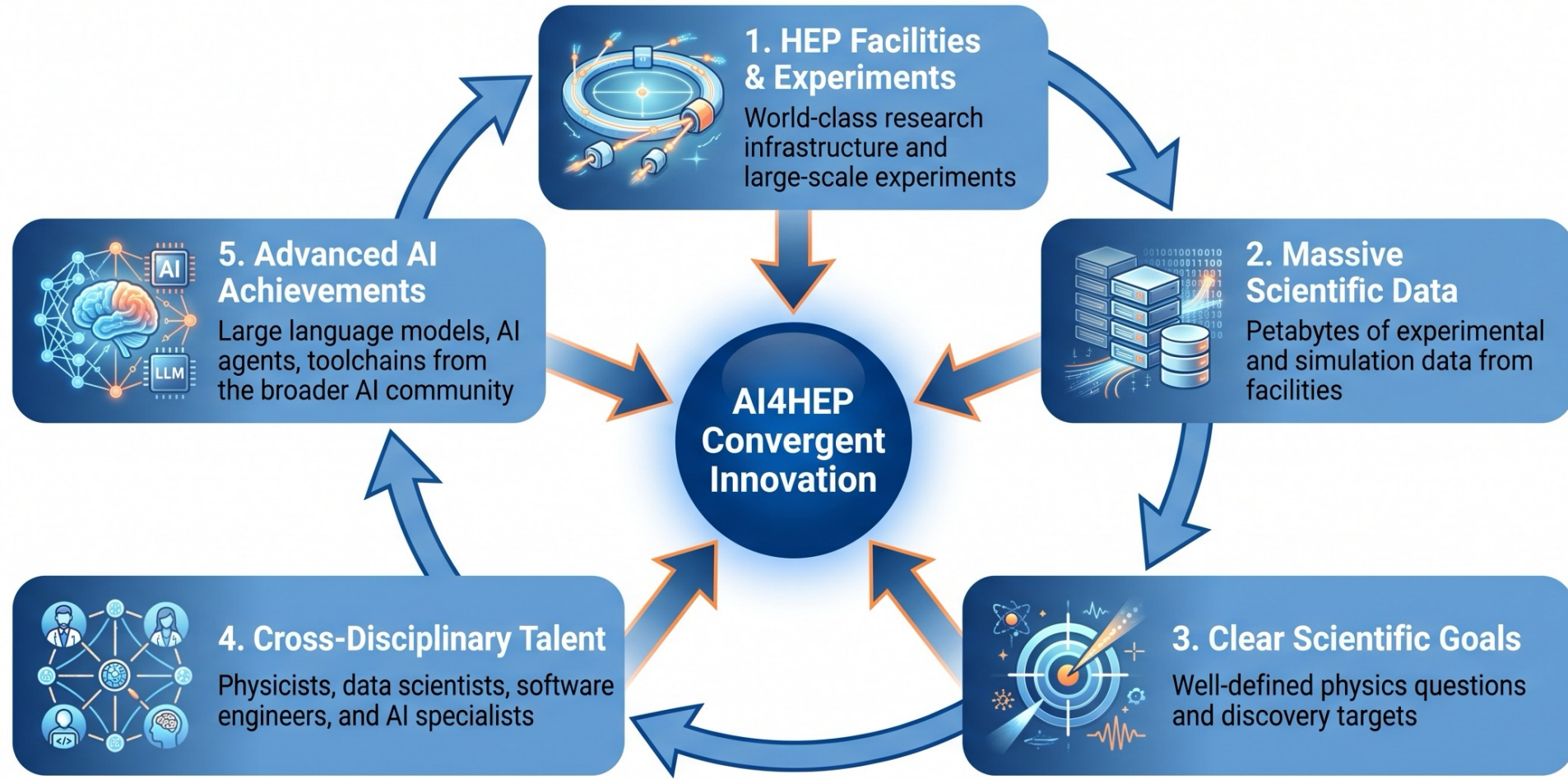
Jiangmen Underground Neutrino Observatory (JUNO)

Dongguan Branch
China Spallation Neutron Source (CSNS)

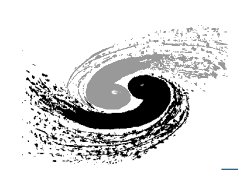
图例：G3201.02523号
自然地理图 印刷

AI4HEP: A Closed-Loop Ecosystem

Five essential elements driving the future of AI-empowered High Energy Physics



With all essential elements in place, AI-empowered HEP research is poised for transformative breakthroughs.

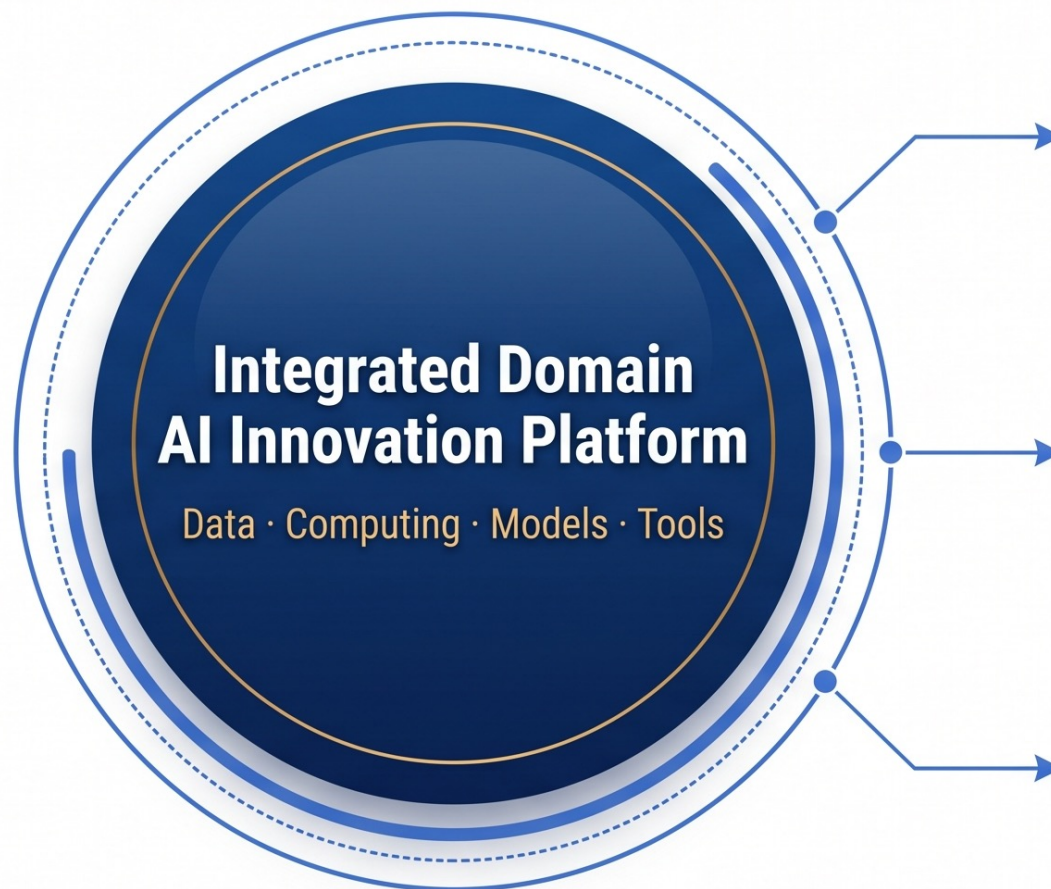


IHEP's 15th Five-Year Plan (2026-2030)

Becoming one of the world's leading **particle physics** research centers, and a large, world-class, comprehensive **multidisciplinary research base**

Area	Priorities (9)	Future Frontier/Tech (6)
Particle Physics	Physics in the Charm Energy Region	Higgs Physics
	Neutrino Physics	CEPC Accelerator and Detector
		BEPCII-UP
Astrophysics	Cosmic Ray & UHE Gamma-ray Astro.	MeV Gamma and UHE neutrino
	Compact Objects & Cosmology	
Multi-Disciplinary Research	Photon Science, Tech & Apps	Future Advanced light source
	Neutron Science, Tech & Apps	
Accelerator	Accelerator Key Technologies	
Applications	Applications of Radiation Tech	
AI and Quantum	AI on Large-Scale Facilities	Quantum Tech.

AI for Large Scientific Facilities — 15th Five-Year Plan



Task 1: AI-Accelerated Particle Physics Discovery

- Develop domain-specific AI models for particle physics
- Improve physical consistency and reliability of AI models
- Enable paradigm shift: AI-driven scientific discovery

Task 2: High-Quality Scientific Dataset Construction

- Build AI-Ready scientific data resources for high-energy physics
- Create standardized, shareable, reusable data systems
- Petabyte-scale data infrastructure

Task 3: Intelligent Photon/Neutron Sources

- AI-driven automation for HEPS and CSNS
- Smart beamlines with real-time optimization
- Autonomous experiment control and data acquisition

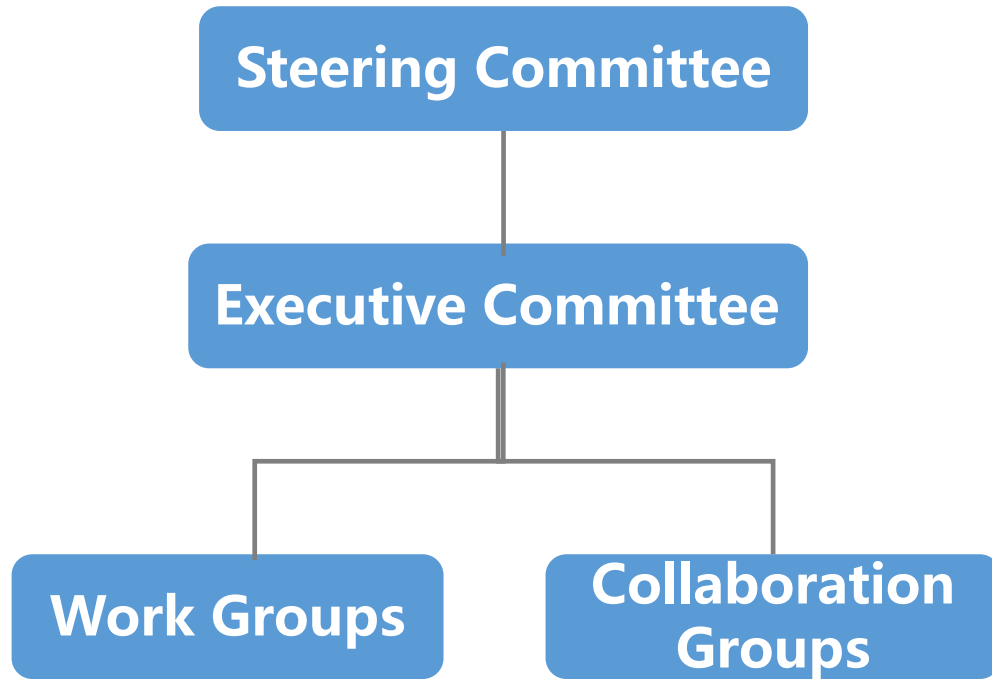
Expected Landmark Achievement: AI accelerates major scientific discoveries in particle physics and large scientific facilities



Organization Structure



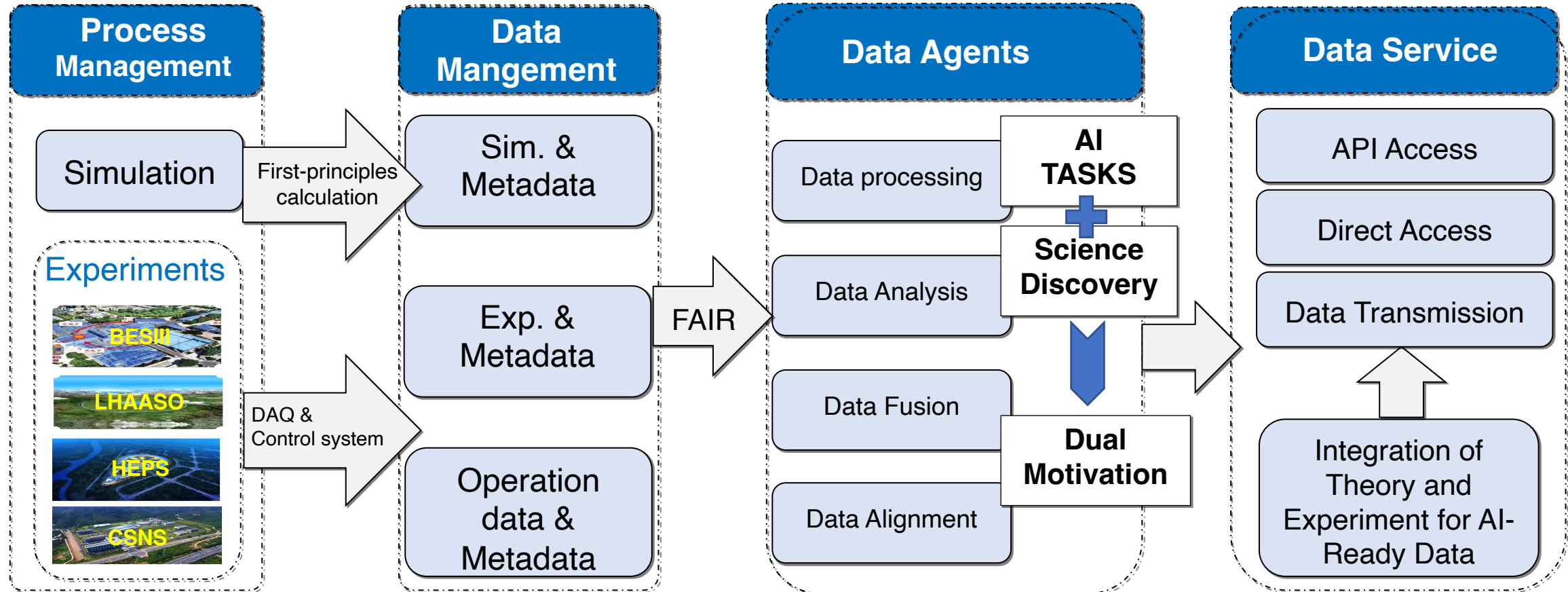
Unite the strengths of all the research units across IHEP to Jointly launch AI/ML research and applications.



High-Quality Data System



- The architecture design of data system (from the perspective of data lifecycle)

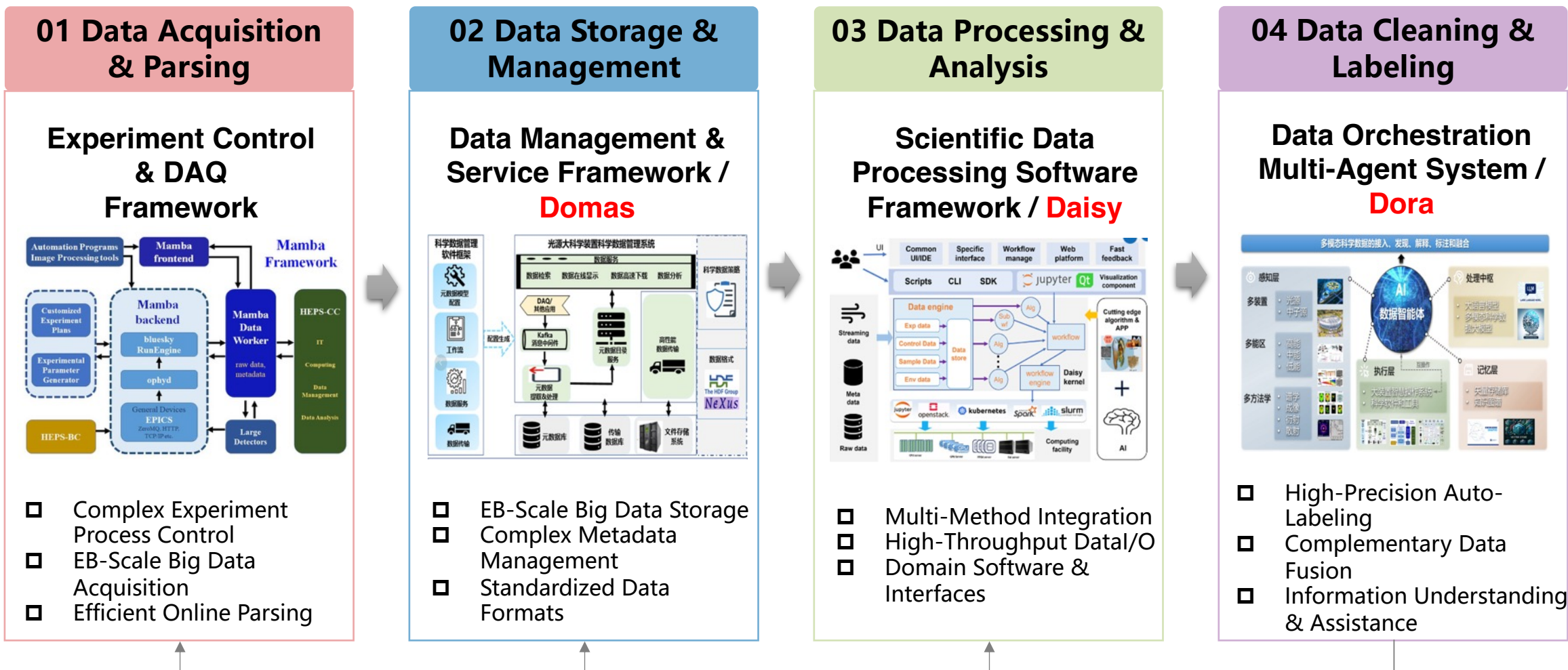


Data Sharing Strategies, Metadata Standards, Data Format Specifications

Software Stack for Data System



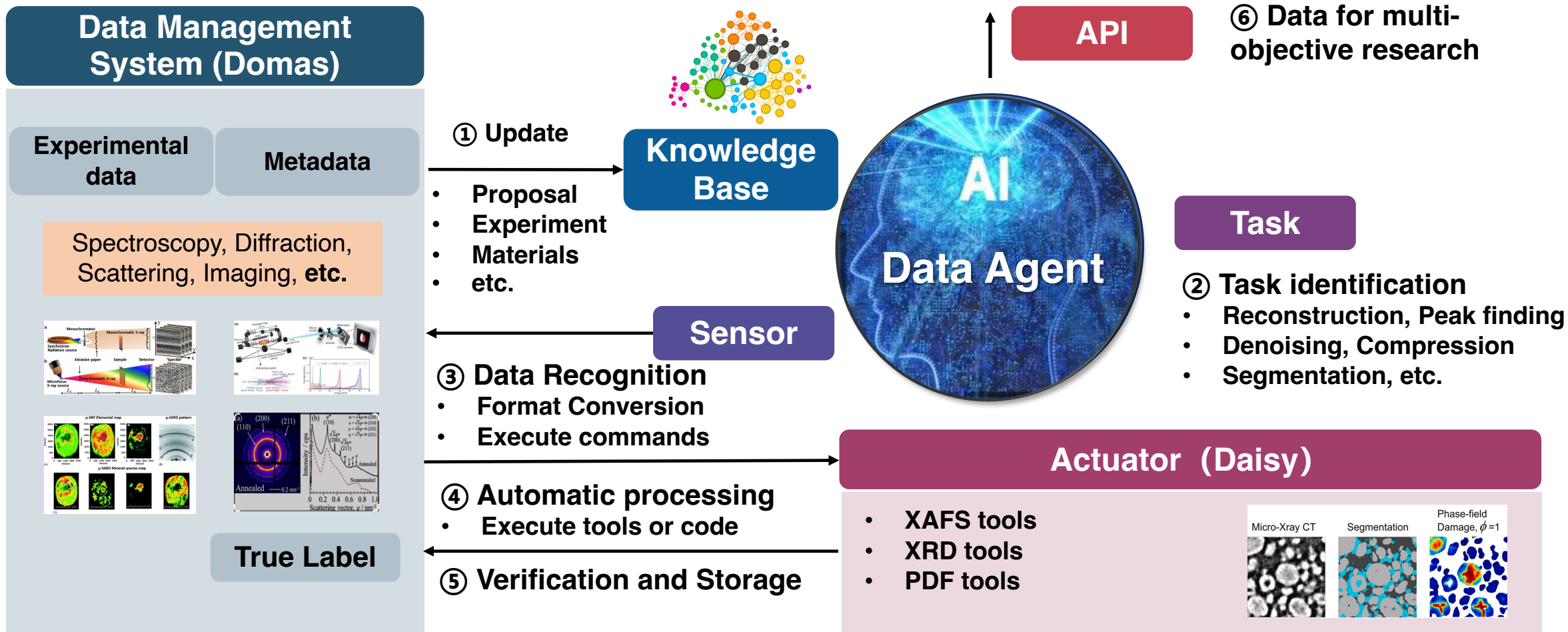
- Not just processing data at isolated stages, but covering the **Full Lifecycle of data**
- A framework spanning the full lifecycle from data production to utilization/application



Data Agent based on LLMs

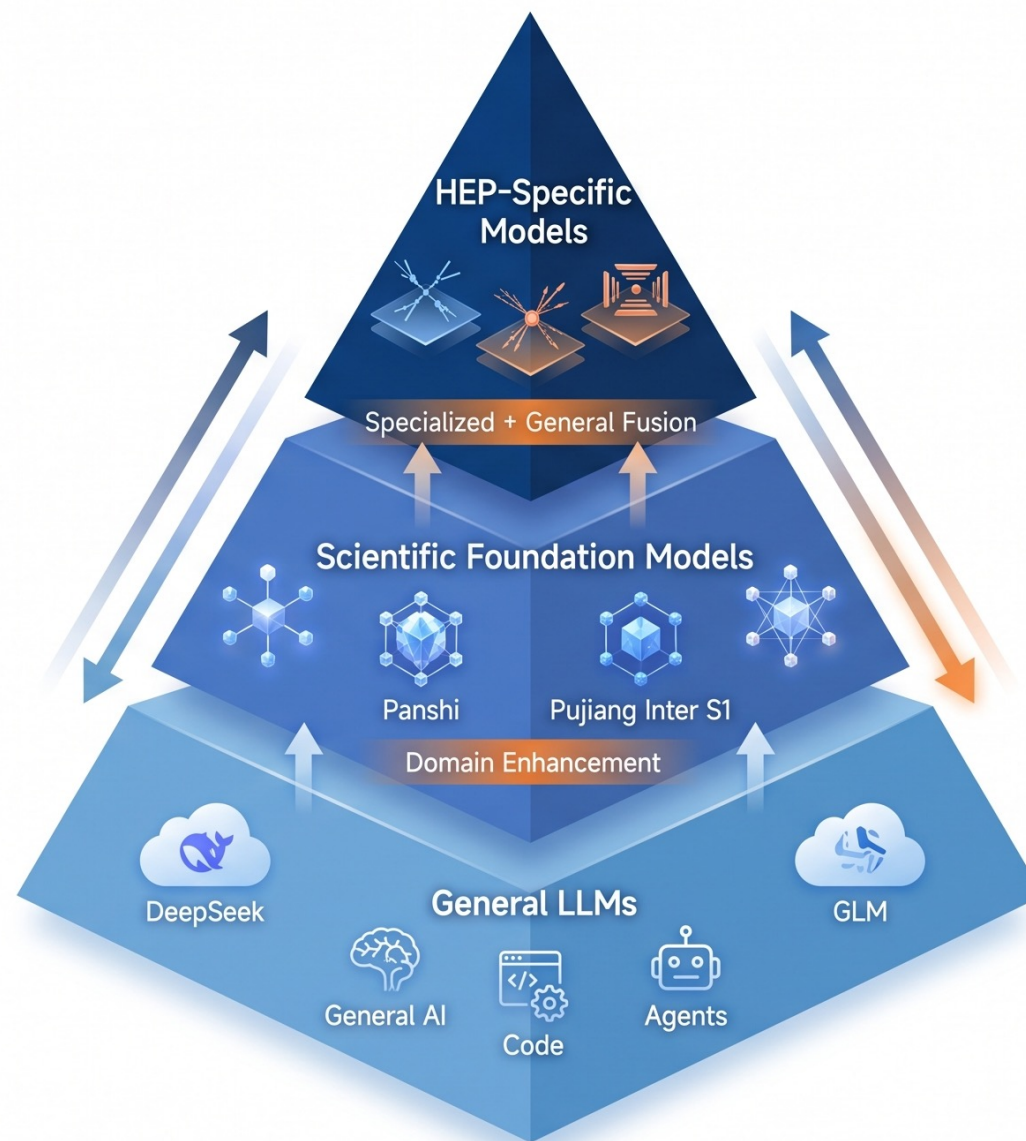


- Utilizing AI agent technology to process and supply ai-ready data



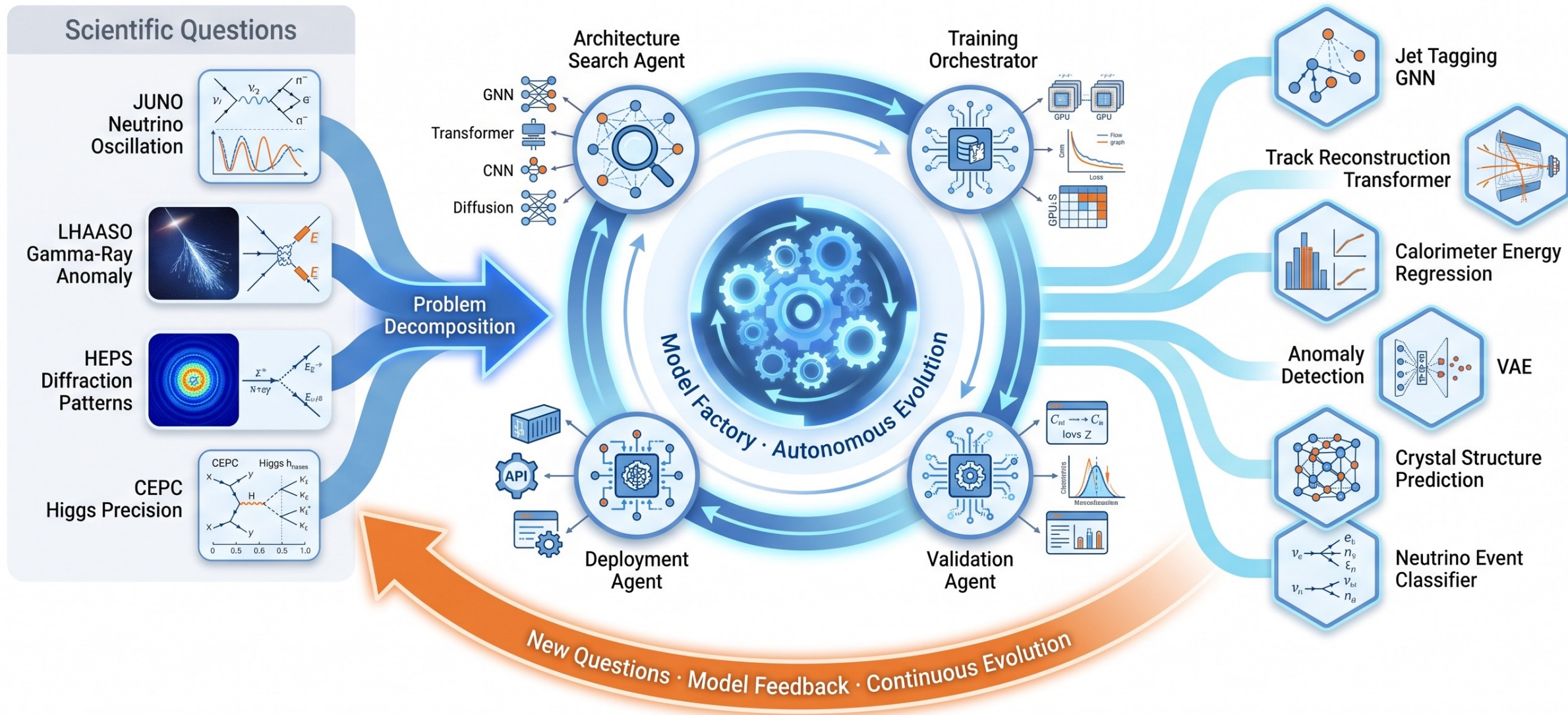
HEP AI Model Development Roadmap

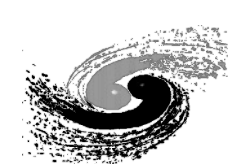
- ① **Foundation:** Leverage industrial/open-source general-purpose large language models (DeepSeek V4 Pro, GLM 5.2) — empowering code generation, agent engineering, and general AI capabilities
- ② **Enhancement:** Build on China's scientific foundation models (Panshi, Pujiang Inter S1) — continuously strengthen domain-specific HEP capabilities for targeted scientific problems
- ③ **Integration:** Develop specialized compact models for specific HEP problems, achieving seamless joint operation between task-specific small models and foundation large models — fusing specialized precision with general intelligence



Towards a HEP Model Factory

Agent-Driven Autonomous Model Evolution for Scientific Discovery





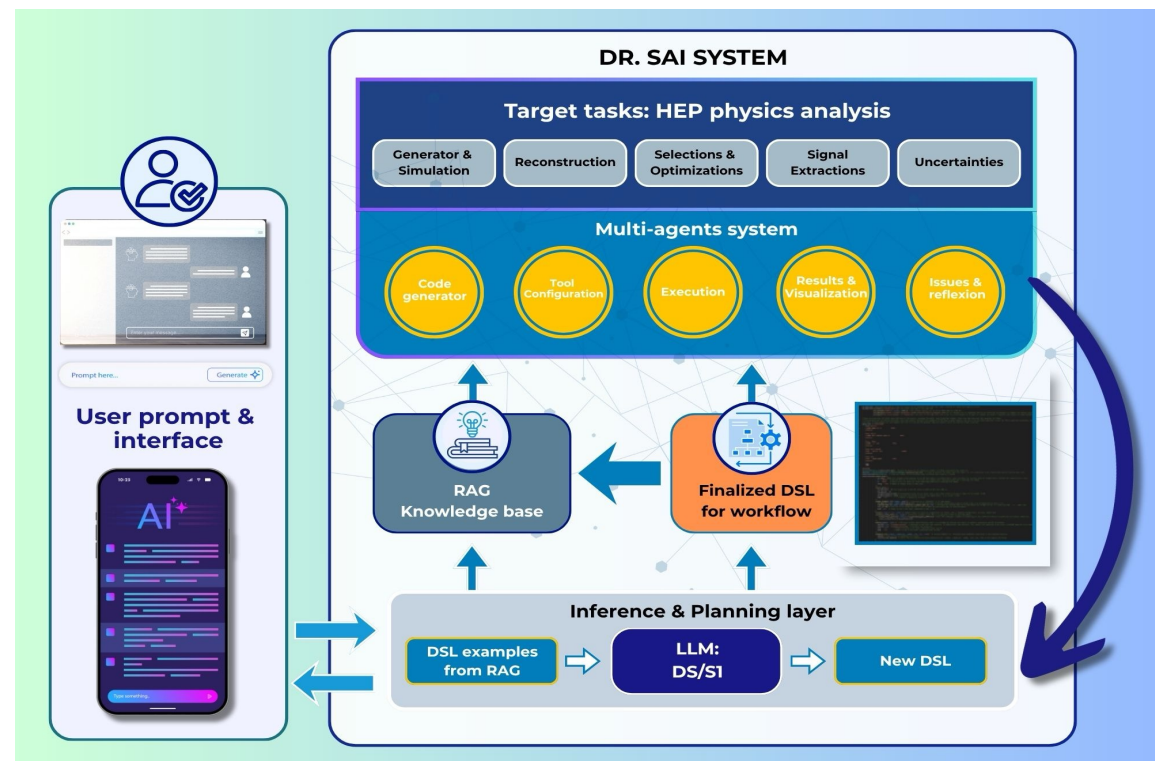
DrSai: AI Agent for Big Science Data Analysis

DrSai: pioneering autonomous physics discovery at **BESIII (and beyond)** through Agentic AI

Dr.Sai $\approx$ **LLM** + **Tools** + **Knowledge** + **Strategy** $\longrightarrow$ Autonomous for simple cases; Collaborative for complex ones

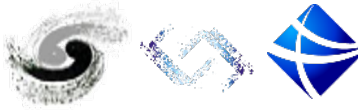
DeepSeek (Qwen/GPT/Gemini) $\longrightarrow$ Previous analyses, “Skills” + Domain-Specific-Language (DSL) + RAG
HPC, BESIII Offline Software System, HTCondor, CERN ROOT, etc.

- ◆ **2023.07: Working Group formed at IHEP**
- ◆ **2024.07: Version 1, proof-of-concept**
 - <https://drsai.ihep.ac.cn>
 - talk at ICHEP2024
- ◆ **2025.07: Version 2, prototype**
 - Simple analysis with prior knowledge
 - Validated by 10 analyses of J/psi decays
- ◆ **2026.07: Release the first practical DrSai**
 - Scalable: automatic DSL extraction from papers by AI
 - Continuously Learning: expert feedback standardized and stored as knowledge
 - Several real analyses ongoing at BESIII
 - **Extend to: JUNO data production, ATLAS DQM, CMS ntuple analysis, neutron/light source analyses**



[Front. Phys., 2026, 21\(9\): 096401](#)

From DrSai to Open DrSai



A Foundation framework / software package for all agents

Opensourced:

<https://github.com/hepai-lab/drsai>

03 More Agents

...

01 DrSai BESIII

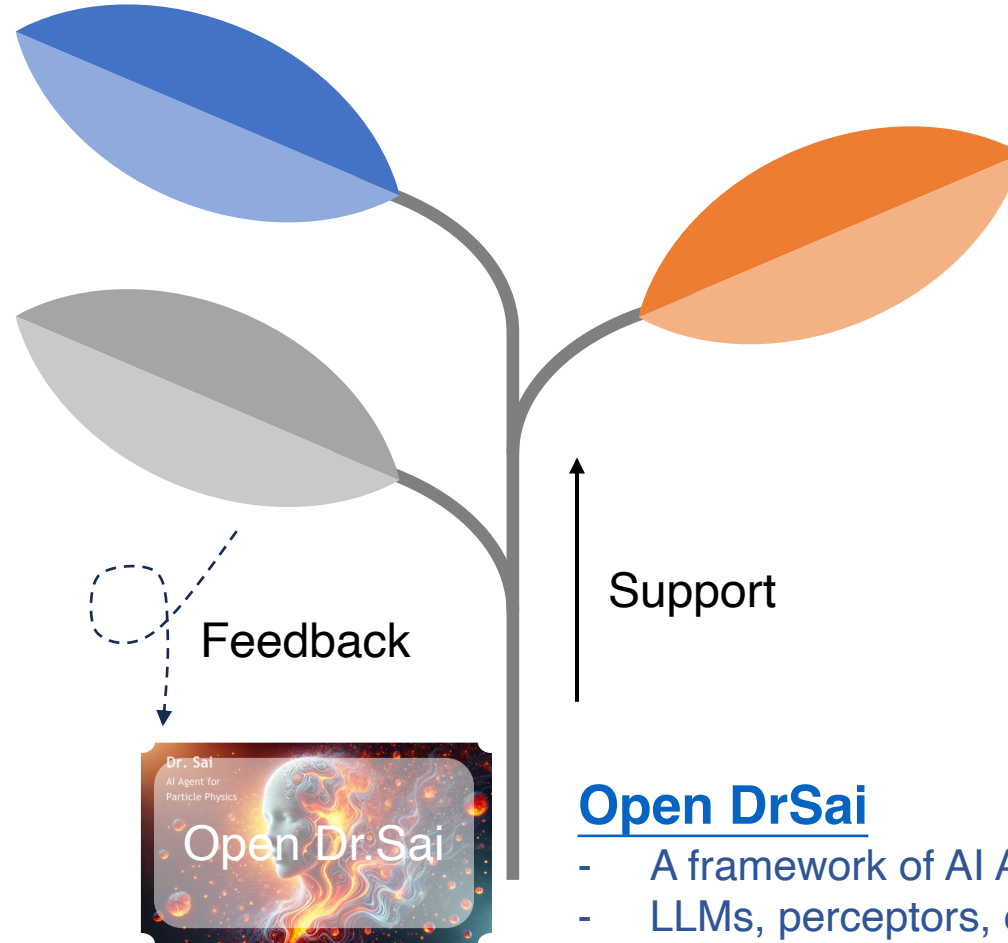
Physics analysis agent

- Enhance physical abilities
- Perceive BESIII data
- Equipped with BOSS tools

02 HEPS Data Agent

Light source data agent

- Enhance data capability
- Perceived light source data
 - Equipped with subject methodology tools



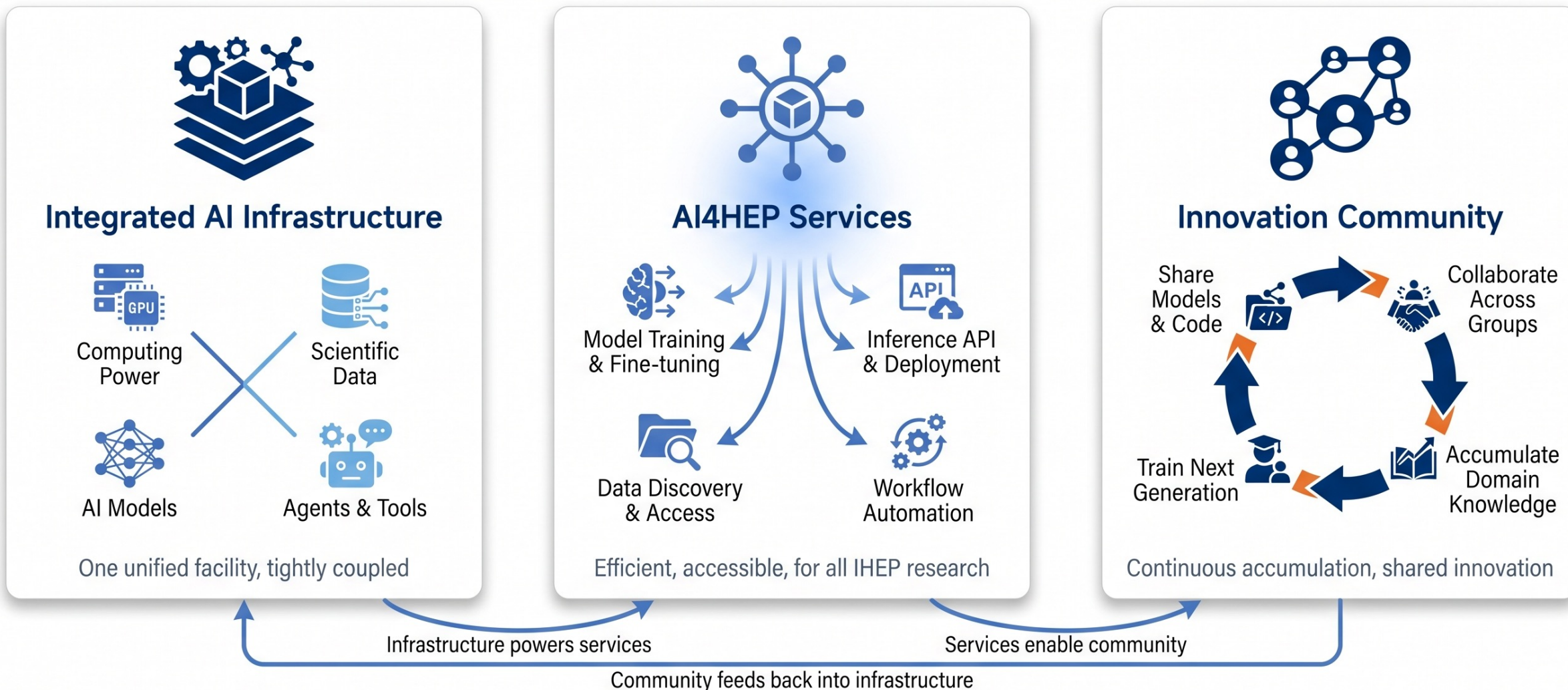
Open DrSai

- A framework of AI Agent for science.
- LLMs, perceptors, executors, and memory
- Multi agent collaborative logic
- Permission verification and human-computer interaction

《Practical Guide to Building AI Agents》：
https://note.ihep.ac.cn/s/_vSnuf5Uh

HepAI: An Integrated AI Innovation Platform for HEP

Building an AI Innovation Hub — Integrating Compute, Data, Models, and Agents into One Facility



Our Goal — Make AI4HEP simpler and more advanced at IHEP

 Next-gen AI Infrastructure

HepAI

高能物理人工智能平台

利用先进的人工智能技术，为高能物理研究提供强大的数据分析、模型训练和科学计算支持。

加速科学发现，推动物理学研究的前沿发展。

 HaiChat智能对话 → Dr.Sai物理分析智能体 HaiAcademic学术助手 AI算力集群

Model service on HEP AI



概览

- 文本生成
- 推理模型
- 代码生成
- 图像理解
- 多模态
- 向量嵌入
- 语音模型
- 数据分析
- 图像生成

高级搜索 >

HepAI Model Plaza

高能所大模型 Startup

1000 元大模型使用额度已发放至平台账户余额

65+ 可用模型
10+ 提供商

浏览全部 文档

搜索模型...

2026-05-20 模型广场全新改版上线，新增概览页、分类浏览、热门榜单等功能

官方推荐 精选



deepseek-v4-pro

HepAI

hepai 私有化部署专业级技术大模型，离线环境下保留高阶代码能力与强数理推理能力，专为内网研发团队打造，满足涉密开发与本地技术研究需求。

离线专业研发 高阶编码



deepseek-v4-flash

HepAI

hepai本地化部署极速技术向模型，离线环境主打高速响应，擅长基础技术问答、简易代码编写与内网快速事务处理。

离线极速 离线技术问答



claude-opus-4-7

Anthropic

旗舰推理 超长上下文



gpt-5.5

OpenAI

全球旗舰 超强推理



kimi-k2.6

Moonshot

长文本专精 多文件解析



glm-5.1

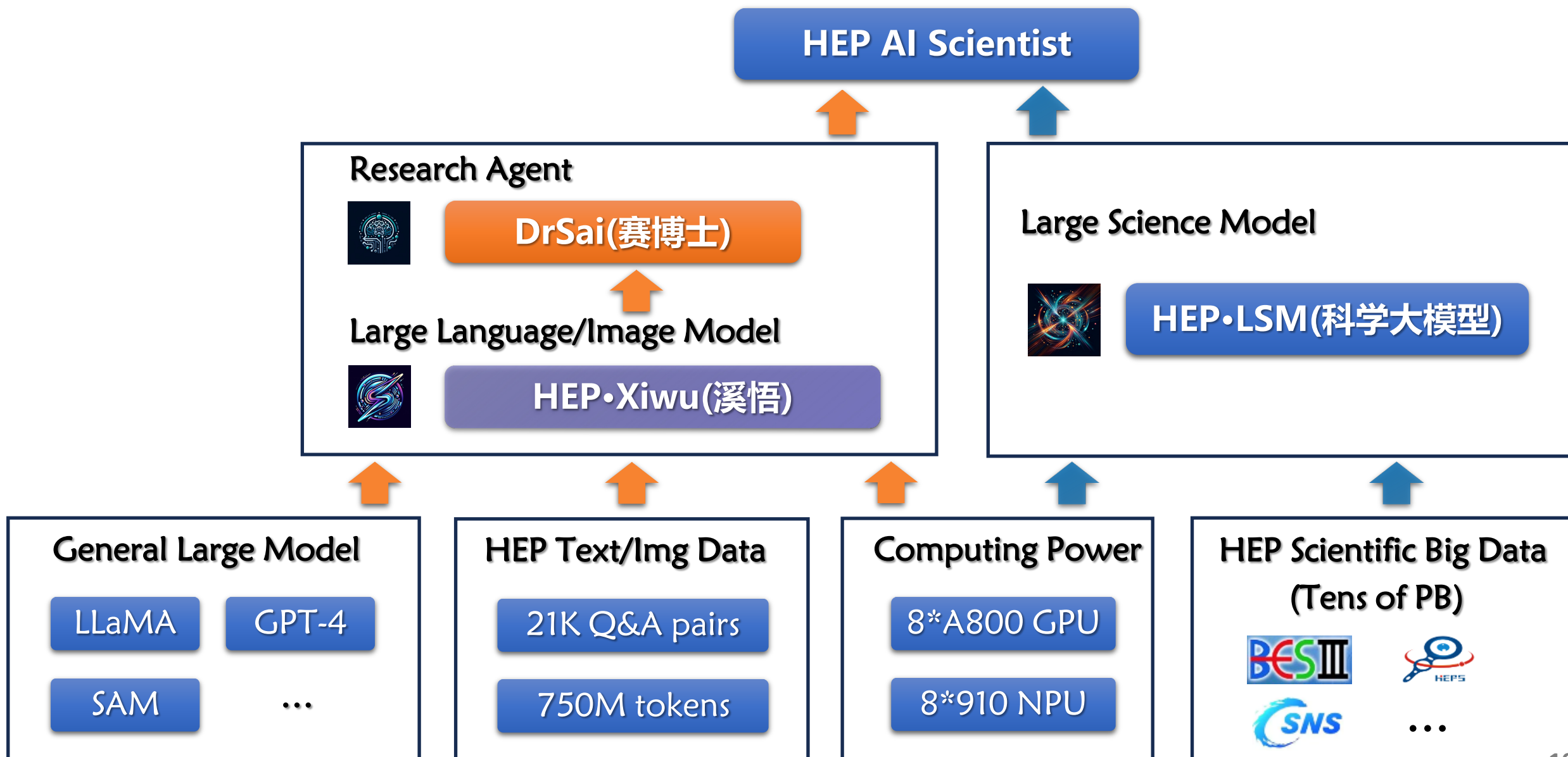
Zhipu

国产全能 多模态

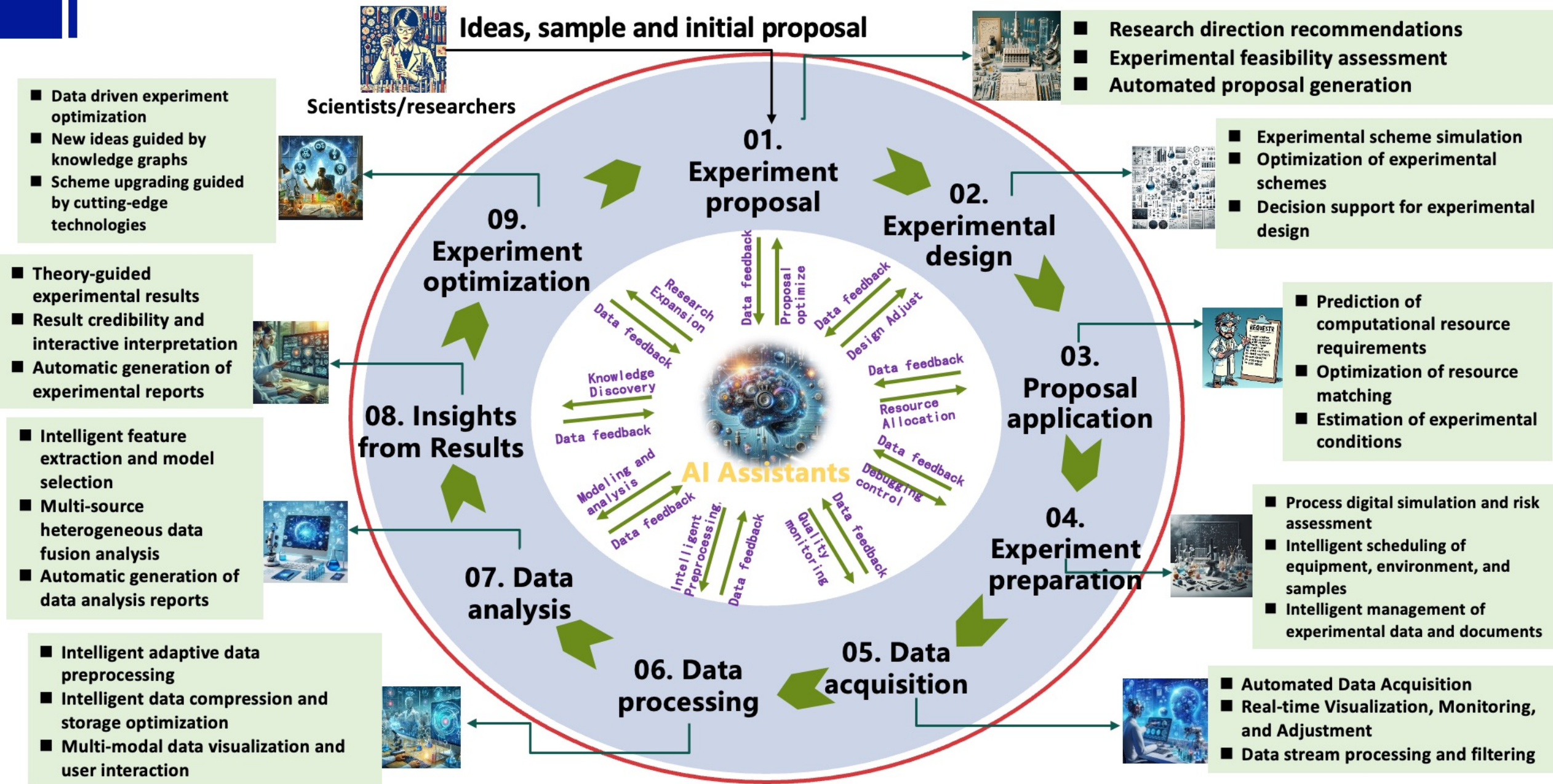
热门场景 按场景发现最适合的模型



Future AI Vision for HEP



Future AI Vision for Photon/Neutron Facilities



Summary and Outlook



Strategic Commitment

IHEP has made AI4HEP a priority and set out a clear development plan — covering computing, data, models, and tools.



New Opportunities

Recent progress in large models and AI agents opens up new possibilities for particle physics research.



HEP Driving AI for Science

IHEP's facilities, datasets, and people provide a strong foundation to push AI for Science forward.



FCPPL Collaboration

We look forward to working together under the FCPPL framework on shared AI challenges.

谢谢！Merci！

Thank you for your attention!