TaSha
n

阿里云

中国科学院大学
University of Chinese Academy of Sciences

星语·大模型驱动
系统化科教科研

他山之石，可以攻玉

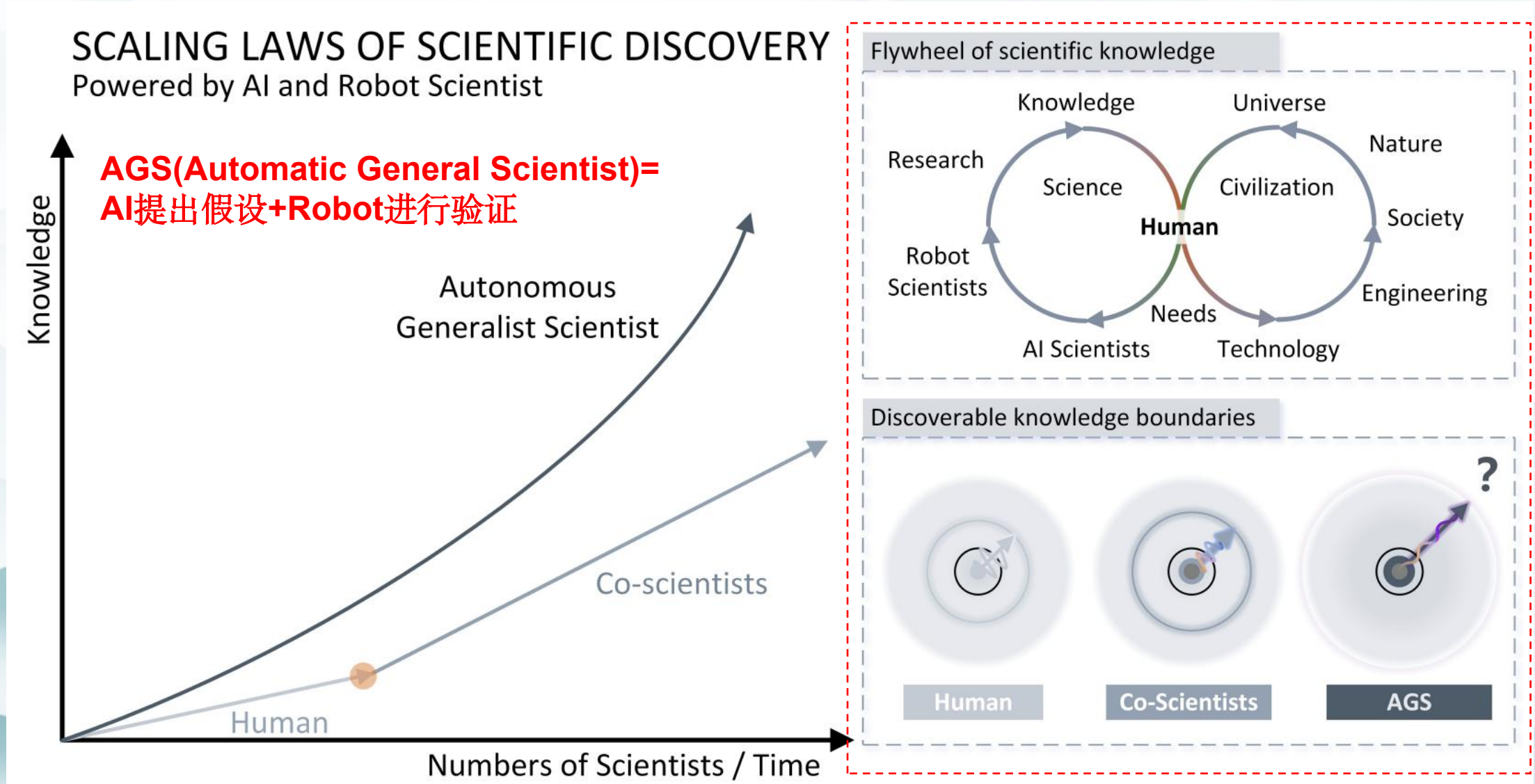
STONES FROM OTHER HILLS CAN LEARN

李瑀旸
中国科学院大学 天文与空间科学学院
国科大他山学科交叉创新协会
他山实验室（筹）

2025

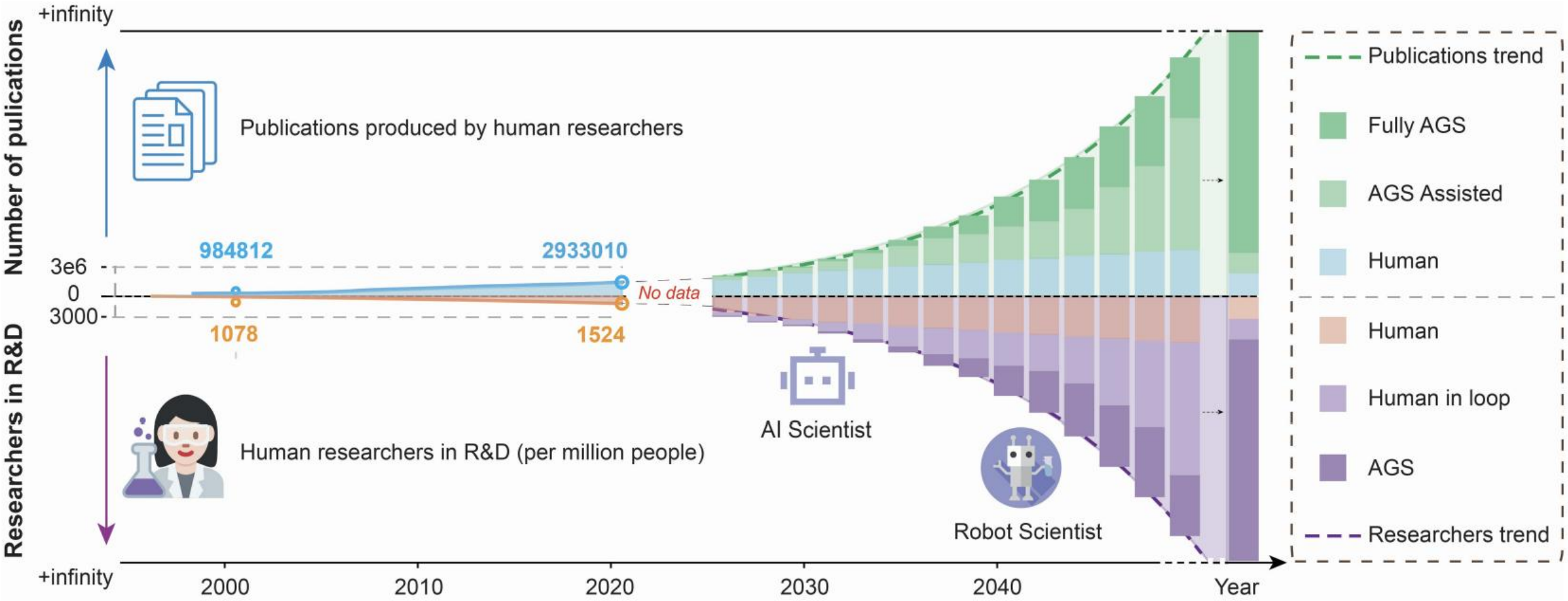
Scaling Laws in Scientific Discovery

科学知识积累
受限于理论提出与实验验证效率



Scaling Laws in Scientific Discovery with AI and Robot Scientists(Zhang et al.2025)

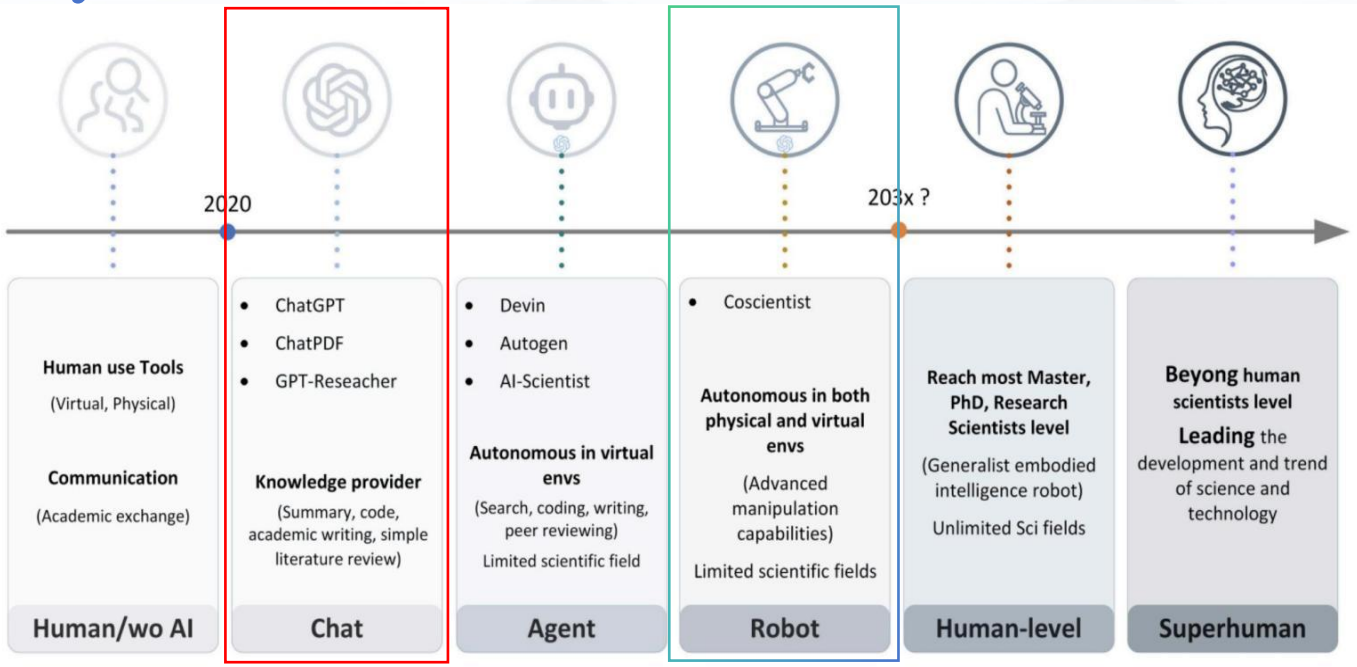
Scaling Laws in Scientific Discovery

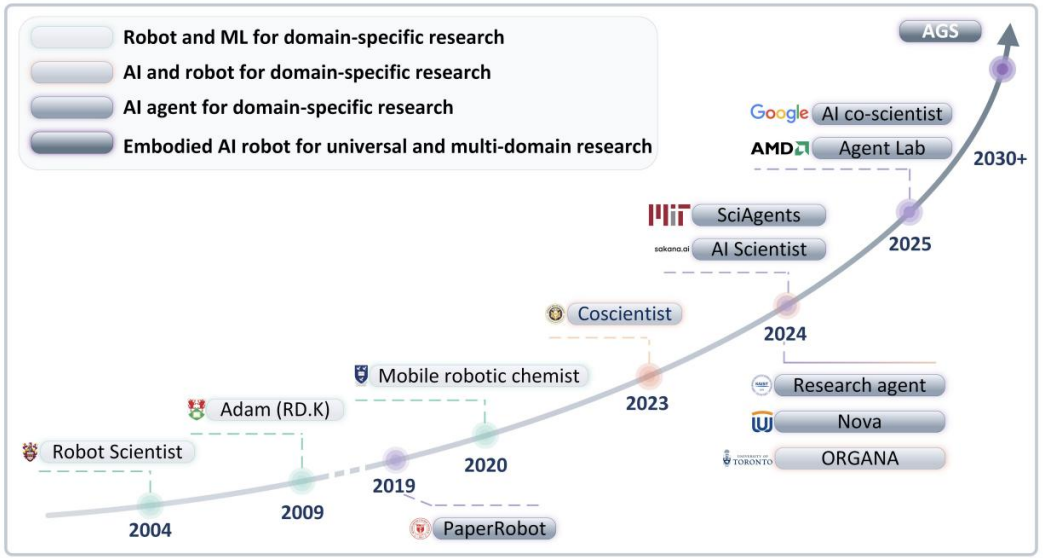


过去：受限于人类科学家数量与受教育水平
未来：人机协同中快速发展与不断调整

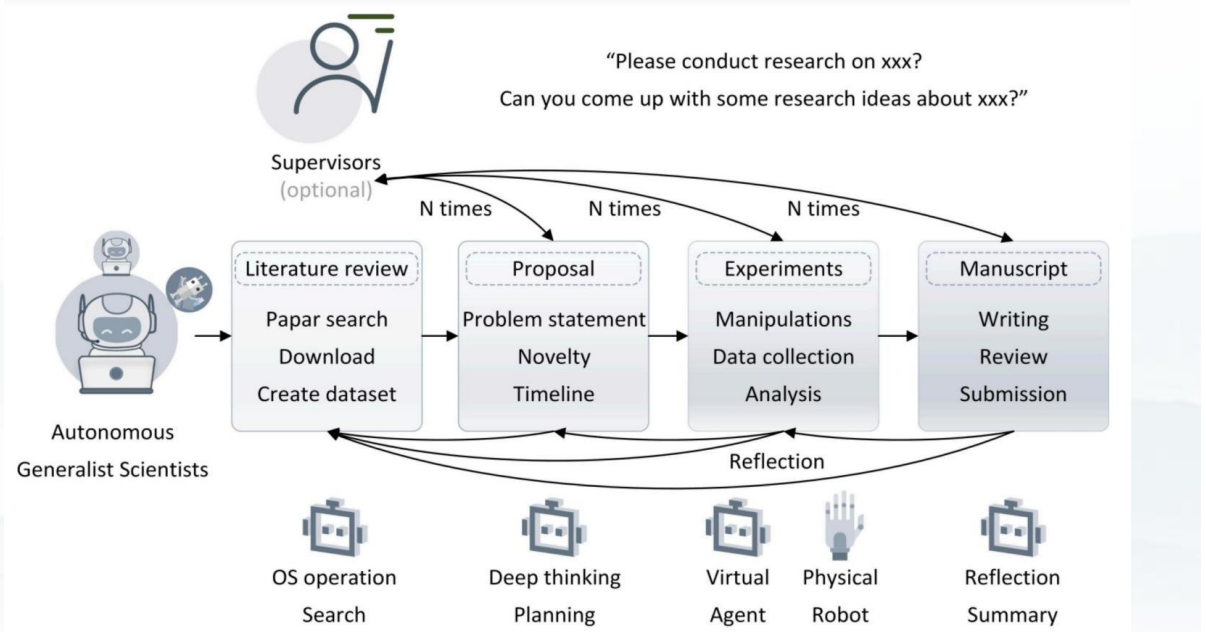
Scaling Laws in Scientific Discovery

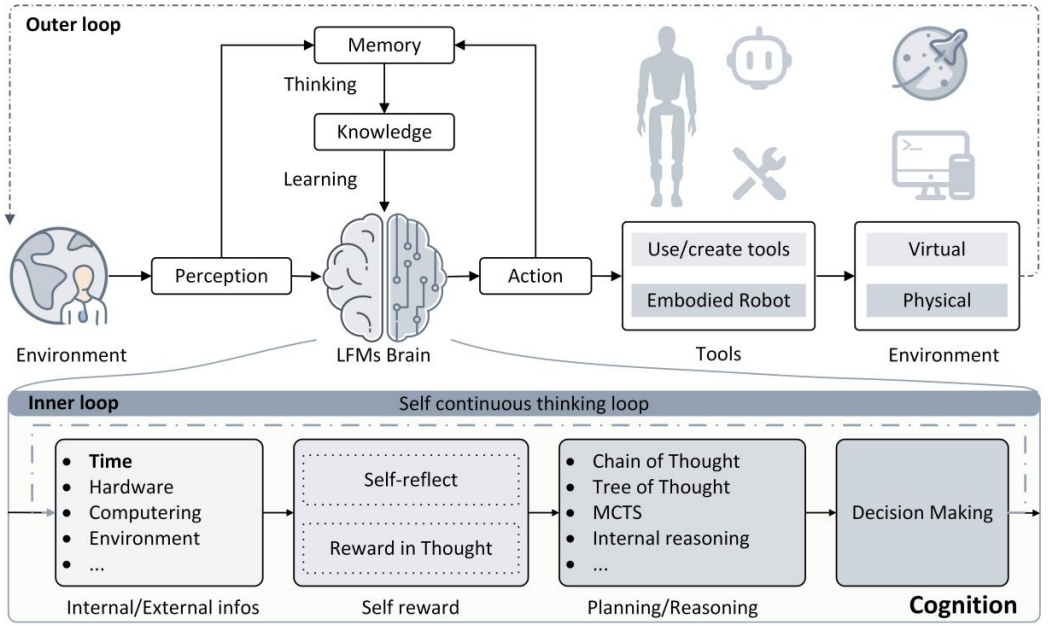
Generality	Human Involvement	Interaction	Knowledge Access	Typical Examples	Description
Level 0: No AI	Complete human	Limited tools	Fixed	Excel, Matlab	*Humans do everything, no AI.*
Level 1: Tool-Assisted	Predominantly human-driven	Limited virtual env	Internal; API search	ChatGPT; Basic ML Models	*AI helps with simple tasks, humans lead.*
Level 2: Assistant	Significant human oversight	Virtual env	Internal; web search; virtual experiment	OpenDevin; DeepResearch	*AI does complex virtual tasks, humans supervise.*
Level 3: Partner *Reach human-level like undergraduate and master.*	Collaborative human-AI/Robot interaction	Virtual and physical envs	Internal; Web search; Physical experiment	Advanced Agent; Advanced Robot	*AI/robots handle experiments, humans guide.*
Level 4: Researcher *Toward human-level like PhD and Prof.*	Minimal human supervision	Advanced interaction with virtual and physical envs	Internal; Autonomous search; Creating knowledge	AGI Robot (AGIR)	*AI leads research, humans supervise and review.*
Level 5: Pioneer *Outperform human-level*	Fully autonomous	Fully autonomous interaction in all envs	Internal; Autonomous search; Groundbreaking innovations	Artificial SuperIntelligence Robot (ASIR)	*AI manages all research, no human needed.*

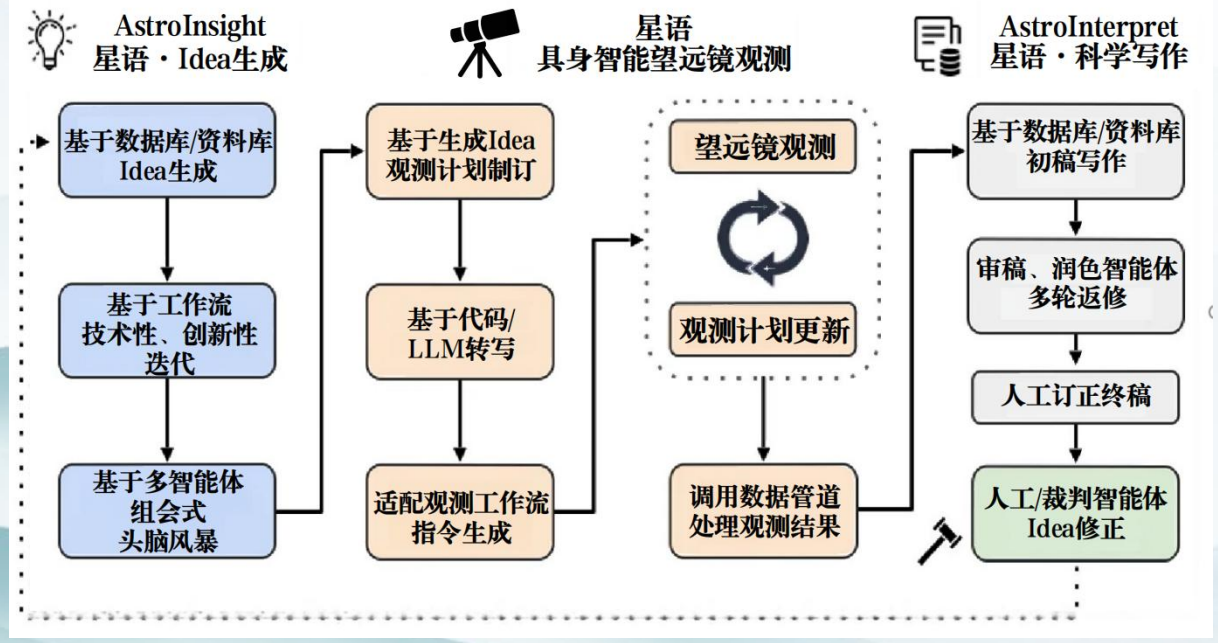


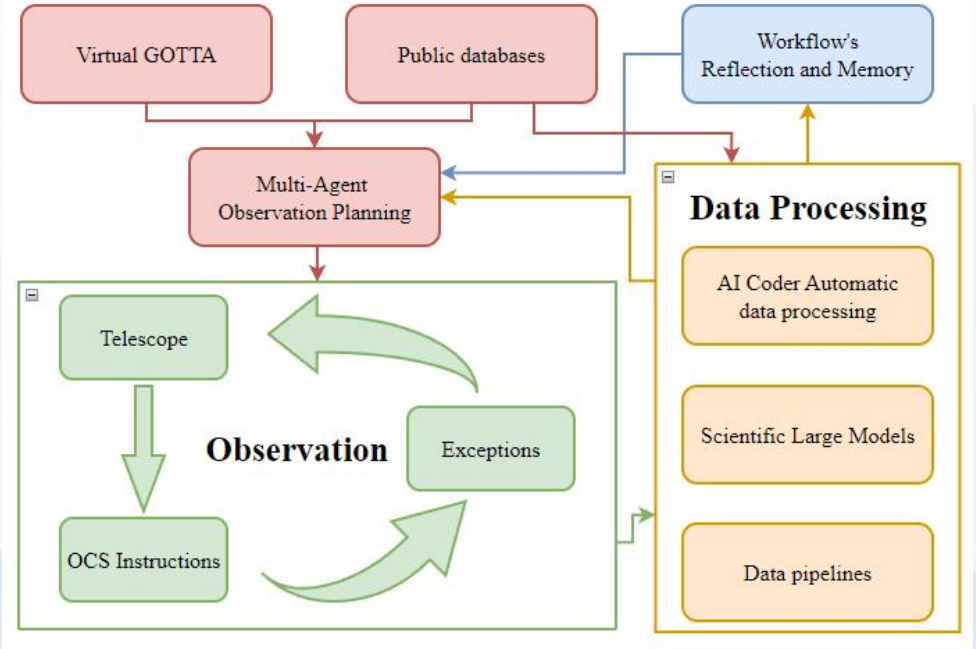


Project/ Method	AI	Robot	Role	Literature review	Proposal	Virtual Experiment	Physical Experiment	Writing Review	Domin
Adam(2009)	×	Equipments	Autonomous	×	Yes (limited)	×	√	×	Single (Biology)
PaperRobot (2019)	ML	×	Assistant	Reading	√	×	×	×	Single (Biomedical)
Coscientist (2023)	LLM agent	Equipments	Assistant	API search	Experimental design	Coding, browser	√ (limited)	×	Single (chemistry)
AI Scientist (2024)	LLM agent	×	Autonomous	API search	√	Coding	×	√	Single (Machine learning)
Organa (2024)	LLM	Robot arm	Assistant	×	×		√ (limited)	×	Single (chemistry)
Agent Lab (2025)	LLM agent	×	Assistant	API search	Research plan	Coding	×	√	Single (Machine learning)
AI co-scientist (google, 2025)	LLM agent	×	Assistant	Web search	√	Coding, browser	×	√	Single (Biomedical)
AGS (Future)	Agent	Embodied	Autonomous	√ (General)	√ (General)	√ (General)	√ (General)	√ (General)	Unlimited



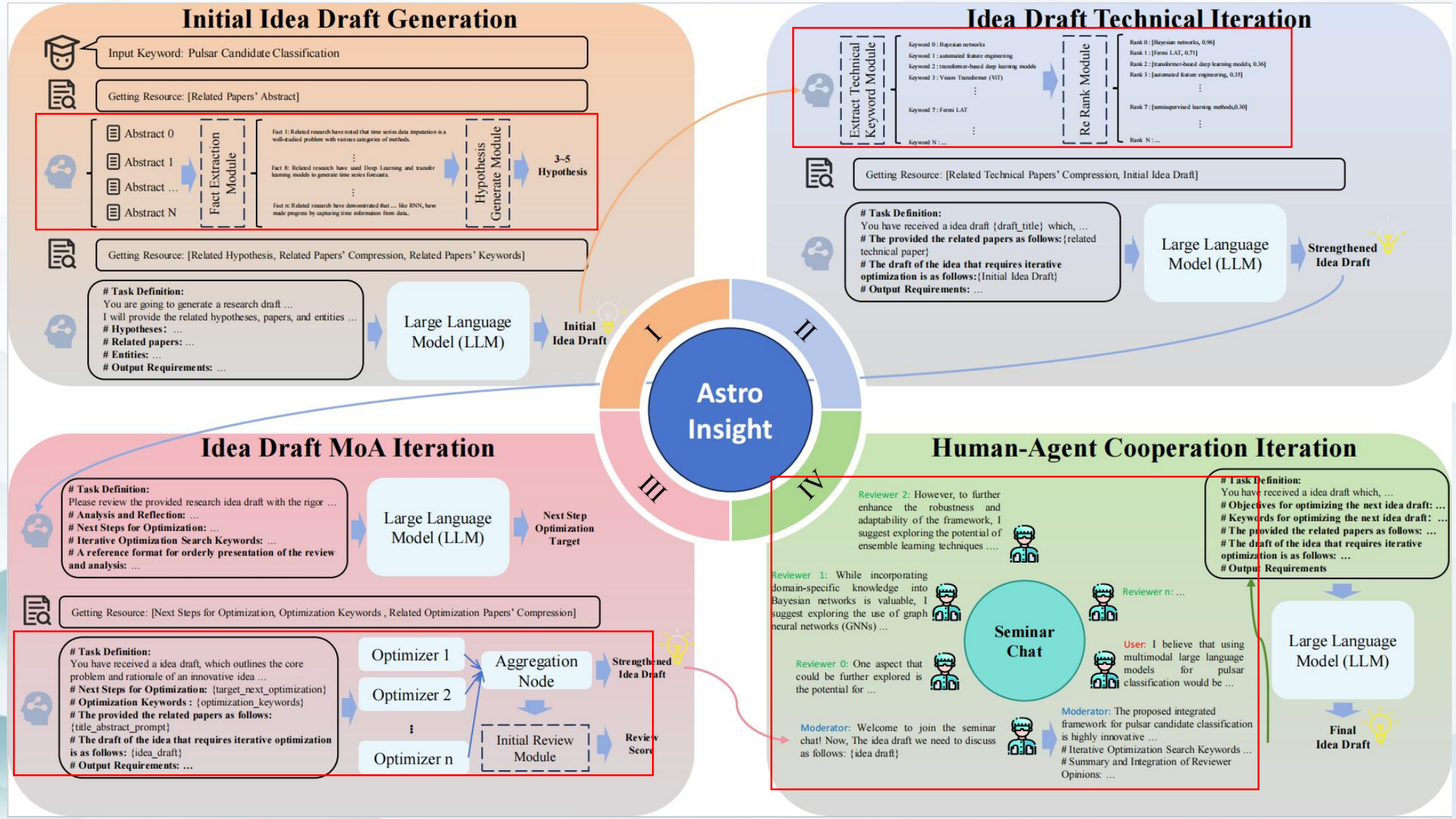






StarWhisper Telescope: Agent - Based Observation Assistant System to Approach AI Astrophysicist. (Wang, C. et

决策智能体

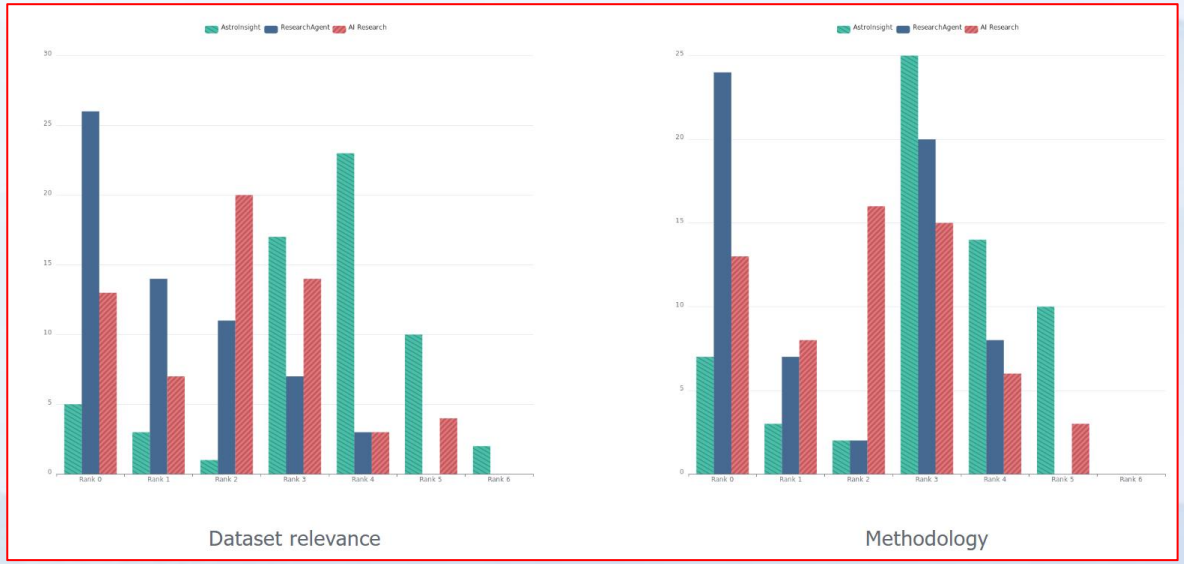

Initial Idea Draft Generation
Input Keyword: Pulsar Candidate Classification
Getting Resource: [Related Papers' Abstract]
Abstract 0
Abstract 1
Abstract ...
Abstract N
Fact Extraction Module
Fact 1: Related research have noted that time series data imputation is a well-studied problem with various categories of methods.
Fact 8: Related research have used Deep Learning and transfer learning models to generate time series forecasts.
Fact n: Related research have demonstrated that ... like RNN, have made progress by capturing time information from data..
Hypothesis Generate Module
3~5 Hypothesis
Getting Resource: [Related Hypothesis, Related Papers' Compression, Related Papers' Keywords]
Task Definition:
You are going to generate a research draft ...
I will provide the related hypotheses, papers, and entities ...
Hypotheses: ...
Related papers: ...
Entities: ...
Output Requirements: ...
Large Language Model (LLM)
Initial Idea Draft
Idea Draft Technical Iteration
Extract Technical Keyword Module
Keyword 0 : Bayesian networks
Keyword 1 : automated feature engineering
Keyword 2 : transformer-based deep learning models
Keyword 3 : Vision Transformer (ViT)
Keyword 7 : Fermi LAT
Keyword N : ...
Re Rank Module
Rank 0 : [Bayesian networks, 0.96]
Rank 1 : [Fermi LAT, 0.71]
Rank 2 : [transformer-based deep learning models, 0.36]
Rank 3 : [automated feature engineering, 0.35]
Rank 7 : [semisupervised learning methods,0.30]
Rank N : ...
Getting Resource: [Related Technical Papers' Compression, Initial Idea Draft]
Task Definition:
You have received a idea draft {draft_title} which, ...
The provided the related papers as follows: {related technical paper}
The draft of the idea that requires iterative optimization is as follows: {Initial Idea Draft}
Output Requirements: ...
Large Language Model (LLM)
Strengthened Idea Draft
I
II
III
IV
Astro Insight
Idea Draft MoA Iteration
Task Definition:
Please review the provided research idea draft with the rigor ...
Analysis and Reflection: ...
Next Steps for Optimization: ...
Iterative Optimization Search Keywords: ...
A reference format for orderly presentation of the review and analysis: ...
Large Language Model (LLM)
Next Step Optimization Target
Getting Resource: [Next Steps for Optimization, Optimization Keywords , Related Optimization Papers' Compression]
Task Definition:
You have received a idea draft, which outlines the core problem and rationale of an innovative idea ...
Next Steps for Optimization: {target_next_optimization}
Optimization Keywords : {optimization_keywords}
The provided the related papers as follows: {title_abstract_prompt}
The draft of the idea that requires iterative optimization is as follows: {idea_draft}
Output Requirements: ...
Optimizer 1
Optimizer 2
Optimizer n
Aggregation Node
Initial Review Module
Strengthened Idea Draft
Review Score
Human-Agent Cooperation Iteration
Reviewer 2: However, to further enhance the robustness and adaptability of the framework, I suggest exploring the potential of ensemble learning techniques ....
Reviewer 1: While incorporating domain-specific knowledge into Bayesian networks is valuable, I suggest exploring the use of graph neural networks (GNNs) ...
Reviewer 0: One aspect that could be further explored is the potential for ...
Seminar Chat
Reviewer n: ...
User: I believe that using multimodal large language models for pulsar classification would be ...
Moderator: Welcome to join the seminar chat! Now, The idea draft we need to discuss as follows: {idea draft}
Moderator: The proposed integrated framework for pulsar candidate classification is highly innovative ...
Iterative Optimization Search Keywords ...
Summary and Integration of Reviewer Opinions: ...
Task Definition:
You have received a idea draft which, ...
Objectives for optimizing the next idea draft: ...
Keywords for optimizing the next idea draft: ...
The provided the related papers as follows: ...
The draft of the idea that requires iterative optimization is as follows: ...
Output Requirements
Large Language Model (LLM)
Final Idea Draft

Topic		
Pulsar Candidate Classification	Photometric Classification (Stars and Galaxies, Stars and Quasars, Supernovas)	Photometric Redshifts
Real-Time Transient Light Curve Detection	Galaxy Morphological Classification	Stellar Spectrum Analysis
Galaxy Cluster Mass Estimation	Astronomical Image Segmentation	Pulsar Signal Detection
Interstellar Dust Distribution Prediction	Galactic Dynamics Studies	Supernova Explosion Prediction
Automated Redshift Measurement	Black Hole Detection and Mass Estimation	Detection of Star-Forming Regions
Star Cluster Evolution Modeling	Quasar Light Curve Analysis	Automated Gravitational Lensing Detection
Astronomical Data Anomaly Detection	Solar Activity Prediction	AI-Assisted Astronomical Instrument Calibration
Optimization of Stellar Evolution Models	Light Curve Fitting	Space Weather Forecasting
Gravitational Wave Source Classification	Study of the Milky Way's Central Black Hole	Galaxy Merger Event Detection
AI-Generated Star Maps	Exoplanet Atmosphere Composition Analysis	Time-Series Astronomy
Detection of Stellar Ejections	AI Automated Telescope Control	Estimating Cosmic Expansion Rate
Study of Dark Energy Properties	Supernova Remnants	Early Light Curve of Supernova
Optical Counterpart of Gravitational Waves	CV Eruption	Early Light Curve of TDE
Narrow Band Photometric	Shock Breakthrough	Red Supergiant Problem
Circumstellar Dust	Simple Degenerate	Double Degenerate Supernova
Binary Precursor Star	Massive Stellar Material Loss	Flare Star
Compact Object	Compact Binaries	Stellar Rotation
Stellar Cycle	Starquake	Be Star Eruption
Exoplanets Detection	Center Engine	Hubble Crisis
Nebular Spectrum	Solar Flare Prediction	Embodied Intelligence Telescope
Astronomical Foundation Models	-	-

Table 3: The topics used in the idea draft generation

Method \ Metrics	Nov. ↑	Fea. ↑	Rat. ↑	Tec. ↑	Dat. ↑	Met. ↑	Des. ↑	Exp. ↑
ResearchAgent	1.66	2.03	1.77	1.52	1.13	1.69	0.90	3.07
AI Researher	2.28	2.46	2.21	2.21	1.98	2.03	2.0	3.41
RAG	2.10	2.10	2.30	2.00	2.40	2.21	2.15	3.00
AstroInsight	**3.15**	**3.10**	**3.00**	**3.46**	**3.44**	**3.08**	**2.77**	**3.41**

数十位国家天文台-贵州大学的研究生、博士后评估，70+筛选天文Topic的评测集，整体分布显著优于其它框架[绿色指标]

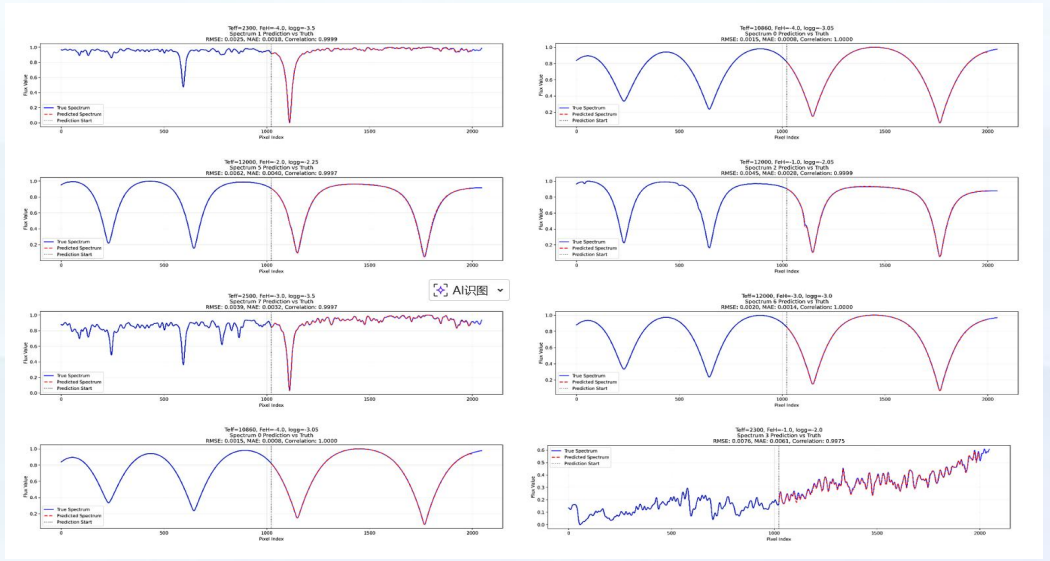


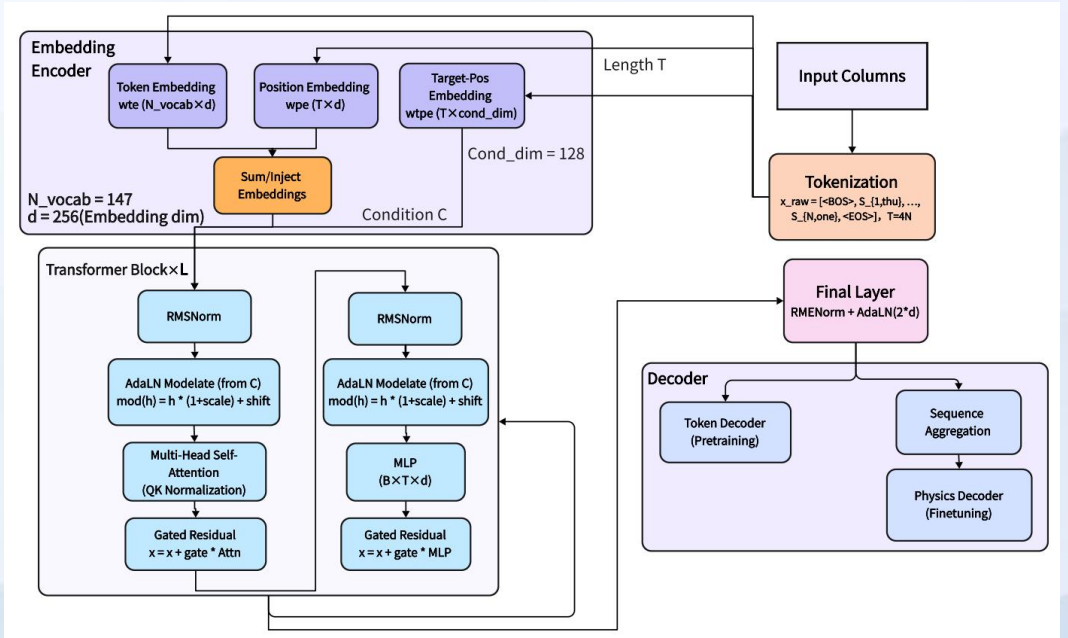
Close to Astrophysicist

模型智能体



星语进行任务识别+多科学模型工具(MCPs)



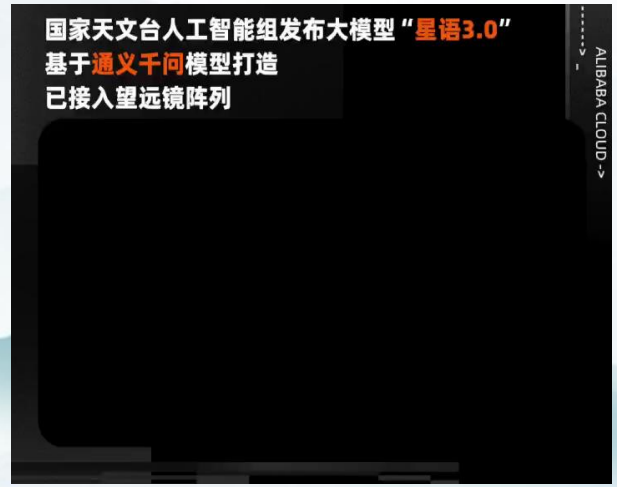


Low-SNR Stellar Spectra as Language: Digit Tokens and Any-Order GPT for Flux Reconstruction and Stellar Parameter Prediction

具身智能望远镜

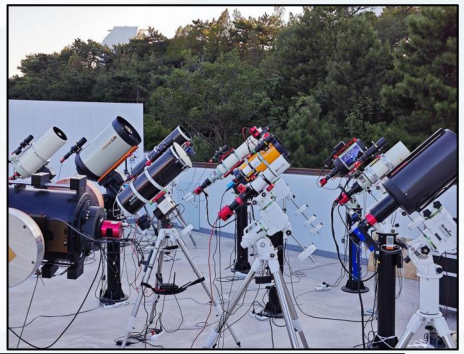
基于星语大模型：基于**大模型智能体**实现人机交互，打通警报发布–台站信息–望远镜状态–实时响应的全链条，极致提升后随观测响应速度

星语3.0
大模型首次接入天文望远镜



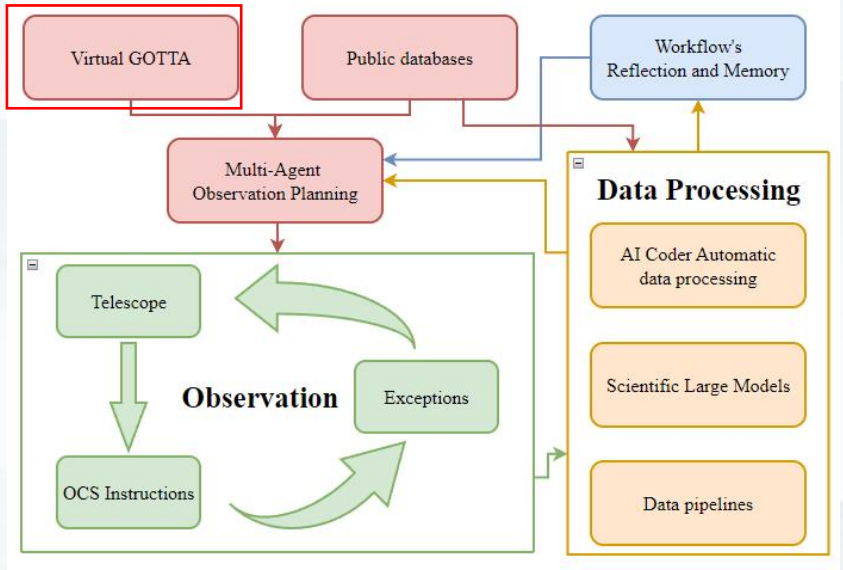
央广网、科学网等
报道星语大模型
（2024-04）

星语4.0：**新华社、人民日报、中新网**报道大模型驱动**近邻星系巡天项目**





星语5.0+：科学级望远镜的**具身智能化VLA**改造



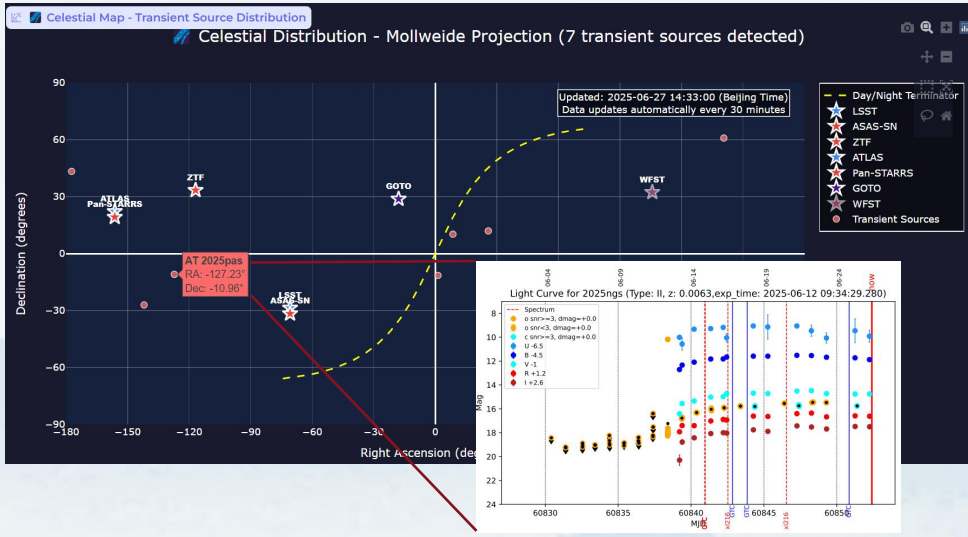
Virtual GOTTA

基于**多智能体**的**全球**暂现源望远镜**数据组网**系统。

目前已提供多颗小于1天爆发的**极早期超新星**的候选警报。

天文多模态得分第一 超过 ChatGPT4o（2024-11）

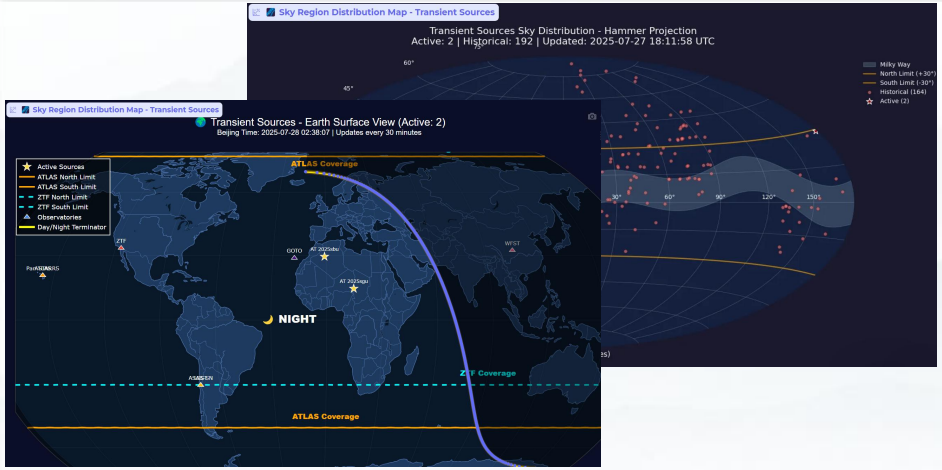
模型	平均	星系天体物理学	宇宙学非星系	高能天体物理	天文仪器和方法	太阳和恒星物理学
Ours-7B	**0.6326**	**0.6289**	**0.5315**	0.6273	**0.7356**	0.6396
GPT4o	0.6167	0.5979	0.5225	**0.6364**	0.6782	**0.6486**
InternVL2-40B	0.5548	0.5567	0.5676	0.5545	0.5402	0.6216
InternVL2-26B	0.5193	0.5155	0.4505	0.4505	0.5747	0.5856
InternVL2-8B	0.5082	0.4536	0.5045	0.5045	0.5747	0.5135
GLM-4V-9b	0.5060	0.5052	0.4054	0.5273	0.5862	0.5225
Cambrian_34b	0.5040	0.5155	0.4685	0.4455	0.5862	0.5856



*Gray indicates that the access is under testing.

具身智能望远镜

University of Chinese Academy of Sciences



Data Integration Agent

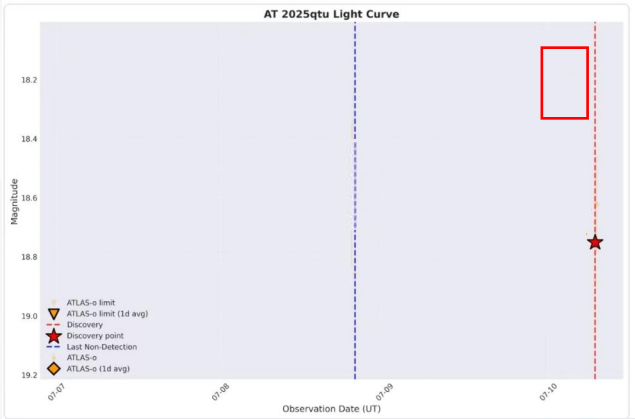
Real-time monitoring of TNS data, Alert Streams of GOTTA nodes, NGSS, ZTF/LSST

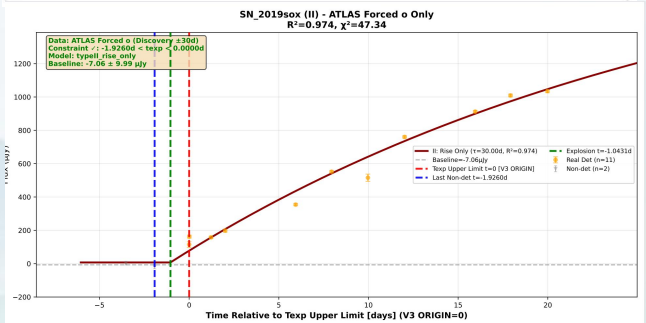
Physical Filters, Stamp Classifiers, **StarWhisper LC2**[LightCurve Large Model trained on LSST simulated data、 finetuned on ZTF and ATLAS], etc.

Scores of supernovae smaller than a day's eruption were confirmed around September.

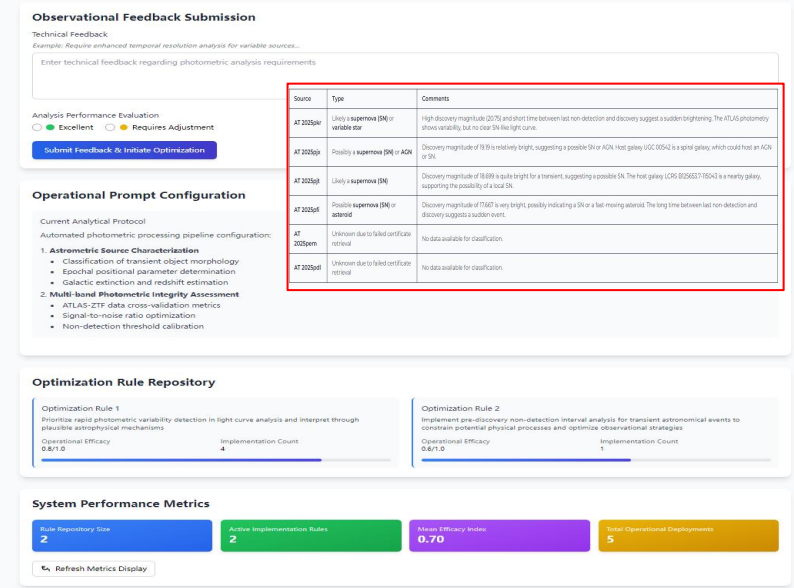
Non - Detection & Discovery Analysis Agent

Based on ATLAS, ZTF, NGSS, GOTTA node forced photometry, and ZTF observation program



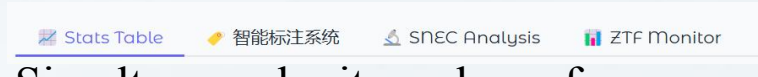


Eruption Time Prediction with Reinforcement Learning PINN



Following Suggestion Agent

Based on the Multimodal Large Model, comprehensive analysis of relevant images, data, and text is conducted to provide source selection ranking.



Simultaneously, it can learn from success/failure feedback to enhance subsequent performance and is capable of linking with the telescope OCS system for rapid triggering.

Traditional vs. SWT-Enhanced

9:00 — 11:00 — 11:30 — 12:00 — 18:00 — 5:00

Create observation list



Search for sources

Check TNS alerts





Any findings yesterday?



Telescope List

Observations





Waiting, Data processing

Long Waits, Competing Priorities, Researcher Fatigue

9:00 — During Day — 18:00 — 5:00

AI-Generated List

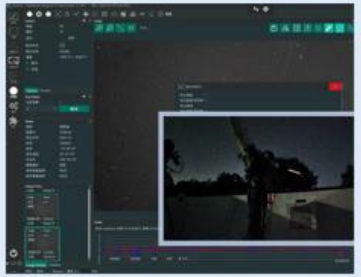
AI Task Interface
√ List Completed

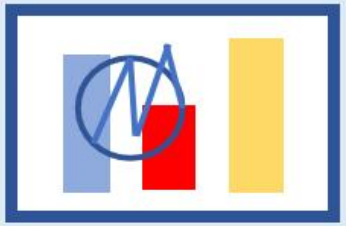
HISPER



Researchers focus on academic work

AI-Controled Observations





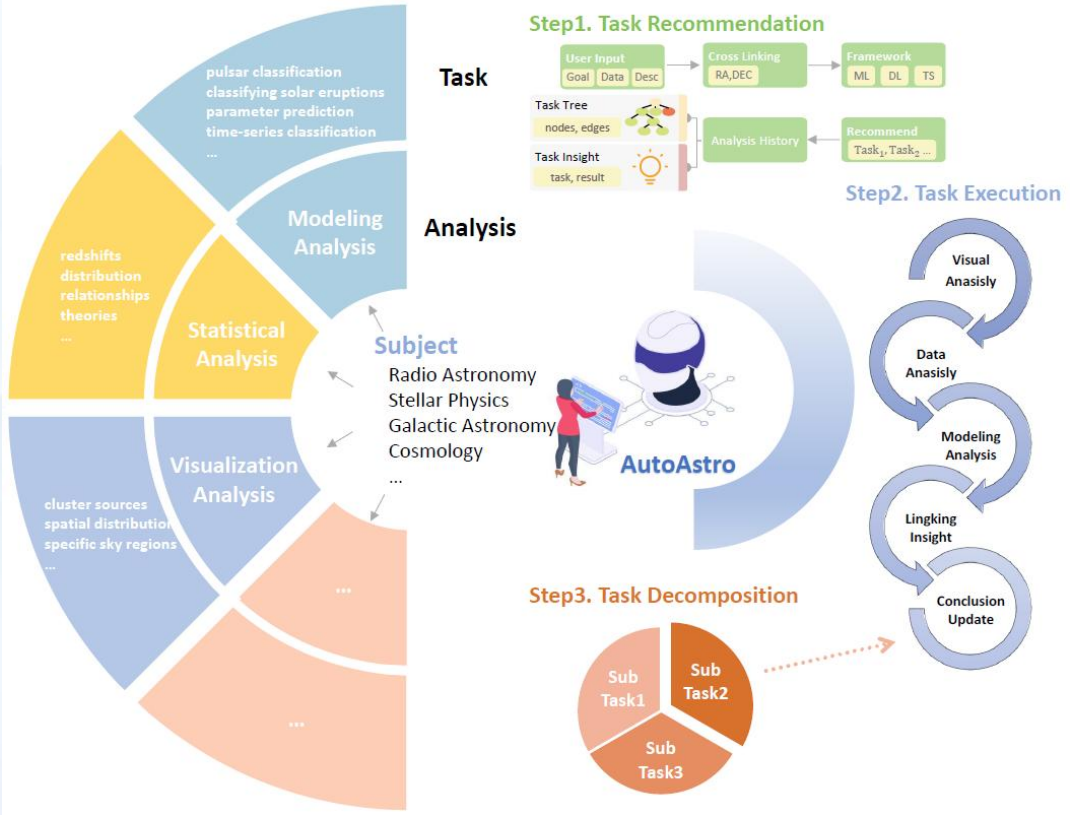


Data Ready

One-click Setup, Autonomous Operation, Researchers Focus on science

数据智能体

Method	Easy to Master	Save Time	Reduced Intervention	Redevelopment	Generalizability	Robustness	Professionalism
ChatGPT 4o	✓✓✓	✓✓	✓	-	✓✓✓	✓✓✓	✓✓
AutoGLM-ChenSi	✓✓✓	✓✓	✓	-	✓✓✓	✓✓✓	-
AutoGen	✓✓	✓✓	✓✓	✓✓	✓✓✓	✓	✓
AstroML	✓	✓	✓	✓✓	✓	✓✓✓	✓
DBGPT	✓✓✓	✓✓✓	✓	✓✓✓	✓✓	✓	✓
AgentPriot	✓✓✓	✓✓✓	✓	✓✓✓	✓✓	✓	✓
DS-Agent	✓✓✓	✓✓✓	✓	✓✓✓	✓✓	✓	✓
AutoAstro(Our)	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓



基于AI Coding
端到端数据管道

任务分支	任务目标概述
太阳射电天文学	基于射电频谱图像数据，构建图像分类模型实现太阳射电爆发类型自动分类（如脉冲型、爆发型等）
星系形态学	利用射电星系图像特征（如延展形态、喷流结构），通过图像分类模型完成射电星系形态学分类（FR Ⅰ/FR Ⅱ 型等）
射电天文学	基于脉冲星信号时频图像特征（如周期特性、色散量），采用图像分类技术实现脉冲星候选体自动识别与分类
时域天文学	① 基于天体流量时序数据（光变曲线），构建时序分类模型实现天体类型（超新星、变星等）或爆发事件（如伽马暴）分类② 以 Label/Type/ddf 等字段为分类目标，处理多波段时变信号特征
	基于流量时序数据（含 mwebv/Teff 等物理参数），构建时序预测模型实现恒星大气参数（有效温度、表面重力等）或天体物理量（红移、光度）预测
恒星物理分析	① 结合恒星赤经 / 赤纬、视星等、绝对星等、温度、半径等参数，分析恒星在赫罗图分布特征② 构建分类模型验证恒星光谱类别与物理参数（光度 / 半径）相关性，识别异常天体（如超巨星、白矮星）
天体分类与形态特征	① 分析天体类别（恒星 / 星系 / 类星体）空间分布特征，识别类别不平衡问题② 比较不同类别天体的 Petrosian 半径（形态复杂度）与通量（亮度）差异，构建基于测光特征（u/g/r/i/z 波段）的分类模型③ 研究红移对天体测光波段相关性的影响，优化红移估计方法
银河系结构与动力学	① 基于银经 / 银纬 / 距离参数，可视化银盘内恒星、星团等天体类型的二维空间分布特征② 构建分类模型分析天体距离（秒差距）与半径的相关性，识别银盘翘曲 / 耀斑等动力学特征
系外行星探测	利用系外行星 transit 效应产生的恒星流量时序数据，构建时序分类模型识别行星候选体（以 LABEL 字段标记行星 / 假阳性信号）
宇宙学研究	① 分析视星等与红移相关性，验证哈勃定律并估计宇宙膨胀参数② 识别红移分布异常值（如特殊速度星系），研究星系距离 - 速度关系演化特征
太阳活动分析	① 基于 RHESSI 卫星 X 射线流量数据，分析太阳耀斑时间分布周期性，识别活动峰年爆发模式② 结合耀斑持续时间、峰值计数率、能量范围等参数，构建分类模型区分不同强度耀斑（C/M/X 级）并预测持续时间
天体测量数据分析	① 分析恒星自行（pmRA/pmDE）分布特征，识别高速运动恒星及测量误差异常值② 通过赤经 / 赤纬度数可视化恒星空间分布，探测高密度星区（如星团）与空洞区域③ 研究 BTmag/VTmag 星等相关性，识别变星候选体并分析位置误差与历元差异的时间效应

配合AstroInsight，挂载天文数据集，比如巡天数据，无间歇进行数据挖掘的智能体







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由数十位老师同学组成的撰稿、内审团队，通过智能体工作流完成16篇综述论文。

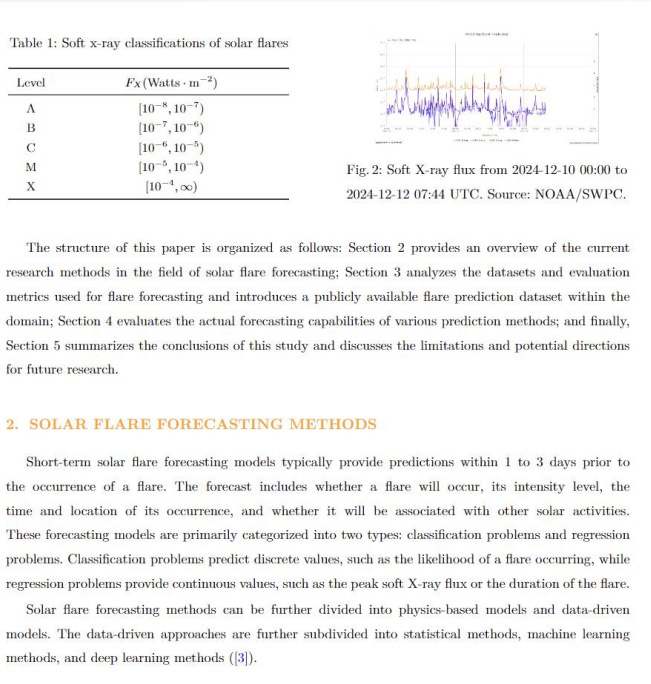


Table 1: Soft x-ray classifications of solar flares

Level	Fx (Watts · m^{-2})
A	$[10^{-8}, 10^{-7})$
B	$[10^{-7}, 10^{-6})$
C	$[10^{-6}, 10^{-5})$
M	$[10^{-5}, 10^{-4})$
X	$[10^{-4}, \infty)$

Fig. 2: Soft X-ray flux from 2024-12-10 00:00 to 2024-12-12 07:44 UTC. Source: NOAA/SWPC.

The structure of this paper is organized as follows: Section 2 provides an overview of the current research methods in the field of solar flare forecasting; Section 3 analyzes the datasets and evaluation metrics used for flare forecasting and introduces a publicly available flare prediction dataset within the domain; Section 4 evaluates the actual forecasting capabilities of various prediction methods; and finally, Section 5 summarizes the conclusions of this study and discusses the limitations and potential directions for future research.

2. SOLAR FLARE FORECASTING METHODS

Short-term solar flare forecasting models typically provide predictions within 1 to 3 days prior to the occurrence of a flare. The forecast includes whether a flare will occur, its intensity level, the time and location of its occurrence, and whether it will be associated with other solar activities. These forecasting models are primarily categorized into two types: classification problems and regression problems. Classification problems predict discrete values, such as the likelihood of a flare occurring, while regression problems provide continuous values, such as the peak soft X-ray flux or the duration of the flare.

Solar flare forecasting methods can be further divided into physics-based models and data-driven models. The data-driven approaches are further subdivided into statistical methods, machine learning methods, and deep learning methods ([3]).

产出凝练技术细节、使用方法论的实验文章，并讨论**正确使用AI工具辅助的、遵守学术道德的**写作方式。

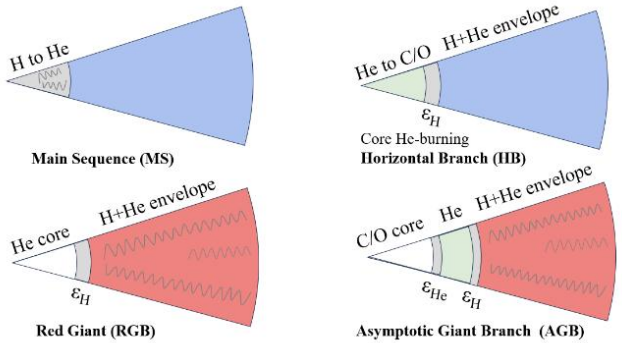


Figure 3. AGB 星的演化过程

得 AGB 星大气层由富氧变为富碳。而且 TP-AGB 阶段会造成恒星星周物质的脱落，形成尘埃包层，尘埃包层由薄逐渐变厚。

2.2. *Observational characteristics of AGB stars*

光学波段的特征。AGB 星根据大气中碳和氧的比值 C/O 的大小，分为 C/O<1 的富氧 AGB（OAGB）和 C/O>1 的富碳 AGB（CAGB），或者根据光谱型划分为 M 型（C/O<1）、S 型（C/O 1）和 C 型（C/O>1）。根据目前的已有研究，关于 AGB 星的观测特征包括：M 型（富氧）AGB：TiO 分子带和后期出现的 VO 分子带；S 型 AGB：具有特有的 ZrO 波段谱线特征；C 型（富碳）AGB：C2 和 CN 分子带（如图4）。

富氧/富碳分子带：OAGB 恒星有 TiO、SiO、H2O 等富氧分子带，CAGB 恒星有 C2H2、HCN 等富碳分子带（如图5）。

富氧/富碳的尘埃特征：有硅酸盐尘埃包层的 OAGB 恒星分为 E 型（10 m 处的发射线特征）和 A 型（10 m 处的吸收线特征），含 SiC 颗粒的 CAGB 星属于 C 型（11.3 m 处的发射线特征）(如图6)。

富氧/富碳尘埃包层的脉泽发射。富氧星周包层的脉泽：1612 和 1665/1667 MHz 的 OH 脉泽，22 GHz 的 H2O 脉泽和 43 和 86 GHz 的 SiO 脉泽。富碳星周包层的脉泽：HCN 和 SiS 脉泽。

TP-AGB 阶段具有大振幅的光变特征。

3. TRADITIONAL AGB STAR SEARCH TECHNOLOGY

在实际观测与数据分析中，AGB 星的识别依赖于多种观测指标与方法。由于 AGB 星在光谱特征、颜色、星等以及脉泽分布上均具有特定的表现形式，因此针对 AGB 星的搜索通常采用多维度的手段进行综合分析。本节将

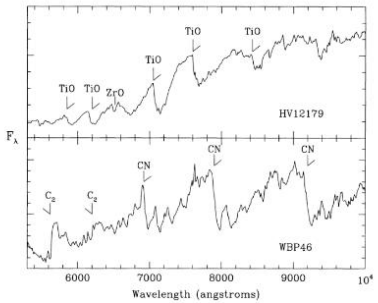


Figure 4. O-rich-C-rich-optical.

编号	一作姓名	指导教师	合作者	题目	overleaf链接	备注	论文状态 请填写下面之一的选项 1. 中文定稿，英文撰写中 2. 英文定稿，终稿打磨中 3. 完成终稿，等待内审 4. 内审完成，准备投稿 5. 已投稿	内审审稿人	使用问题反馈

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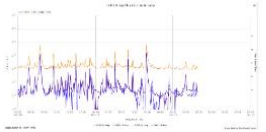


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2.1 Physics-Based Approaches

Physics-based approaches play a crucial role in solar flare forecasting research. These methods attempt

method, which involves observing the slight decrease in stellar brightness caused by a planet passing in front of a star. Apart from exoplanet hunting, TESS's high-precision data also support the study of stellar physics. By analyzing light curves, scientists can study the properties of stars such as rotation, pulsation, and magnetic activity, providing data for the study of stellar structure and evolution.

During its primary mission, TESS conducted a two-year survey of the solar neighborhood. It monitored the brightness of stars to search for periodic dips in brightness caused by planetary transits. As of July 4, 2020, its primary mission came to an end, and now TESS is in its extended mission. The planets discovered by TESS span a wide range, from small rocky worlds to giant planets, clearly demonstrating the diversity of planets in the Milky Way. Additionally, the exoplanets and active star targets identified by TESS will serve as priority observation targets for future missions, such as the James Webb Space Telescope[13]. This will contribute to further research on planetary atmospheres, stellar activity, and more.

TESS completed its primary mission by imaging approximately 75% of the starry sky. This was part of a two-year survey as detailed in Section 2.2. In capturing this vast mosaic, TESS discovered 66 new exoplanets, as well as nearly 2,100 planet candidates, which astronomers are now working to confirm[14].

2.2 TESS Data Acquisition and Processing

TESS's camera design and data collection process are designed to achieve high-precision observations of a large area of the sky. Since the camera is fixed on the satellite, TESS rotates the satellite to achieve different observation areas. During the two-year mission cycle, TESS conducted 26 pointings, each taking about two orbital cycles, covering the entire southern and northern regions of the night sky. These pointings are evenly distributed in the longitude direction of the ecliptic coordinates to ensure the maximum coverage of the sky area. In each observation, the field of view of TESS's four cameras is 24°×24°, and the field of view after synthesis reaches 24°×96°, about 2300 square degrees. One camera is fixed to the ecliptic pole, and the other three cameras are evenly distributed from the ecliptic pole to 6° ecliptic latitude to achieve a wider observation area.

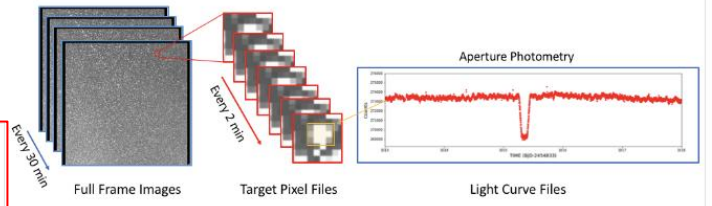


Fig. 1: **Photometric data products**[15]

In actual operation, TESS's camera outputs an image every 2 seconds. To optimize storage and processing, every 60 images are superimposed on the satellite to generate an image with an equivalent exposure time of 2 minutes and stored in the solid-state buffer (SSB). These 2-minute exposure images

Agent4S教育

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主讲人姓名：徐秉煜
主讲人单位：中国科学院空间应用工程与技术中心

L3：
课程名称：智能体基础及开发简介
主讲人姓名：王彬彬
主讲人单位：北京大学心理与认知科学学院

L4：
课程名称：RAG的未来与发展
主讲人姓名：陈昭宇
主讲人单位：中国科学院国家天文台

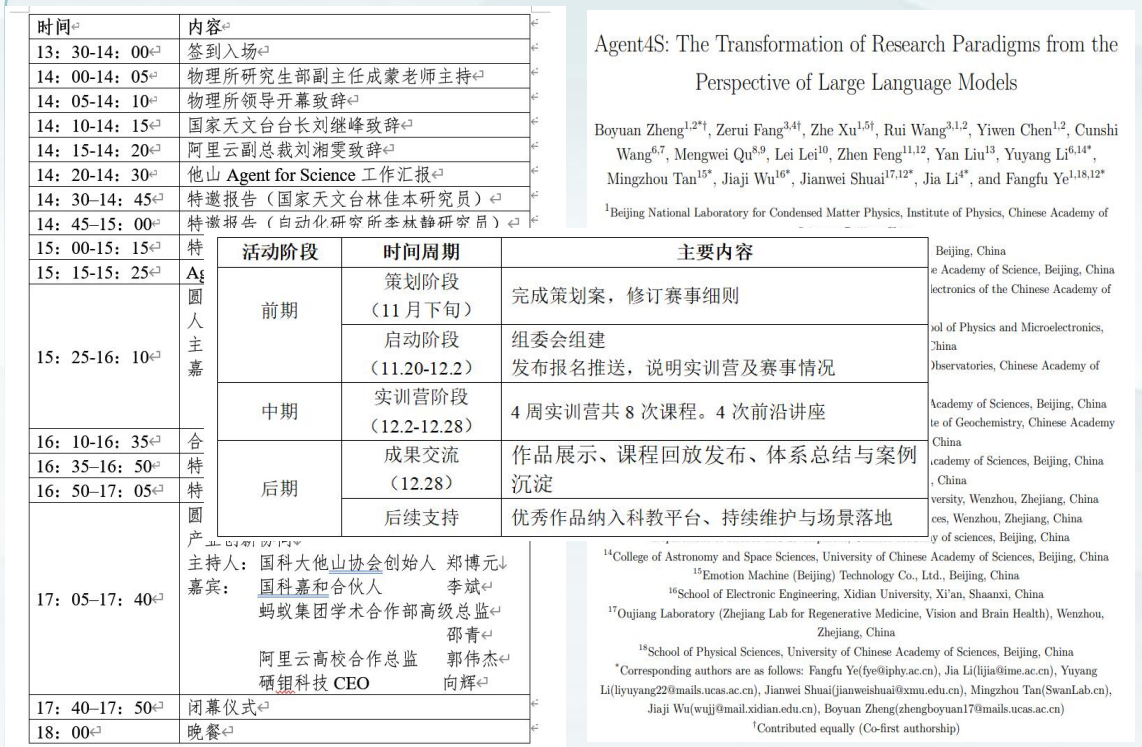
L5：
课程名称：MCP 工具的开发部署与应用
主讲人姓名：葛庆宇
主讲人单位：中国科学院西双版纳热带植物园

L6：
课程名称：上下文工程与智能体工作流开发
主讲人姓名：李瑀旸
主讲人单位：中国科学院大学天文与空间科学学院

L7：
课程名称：人工智能时代的跨学科交流新范式
主讲人姓名：陈逸雯
主讲人单位：中国科学院物理研究所



线上课程培训智能体与工作流技术



时间	内容
13：30-14：00	签到入场
14：00-14：05	物理所研究生部副主任成蒙老师主持
14：05-14：10	物理所领导开幕致辞
14：10-14：15	国家天文台台长刘继峰致辞
14：15-14：20	阿里云副总裁刘湘雯致辞
14：20-14：30	他山 Agent for Science 工作汇报
14：30-14：45	特邀报告（国家天文台林佳本研究员）
14：45–15：00	特邀报告（自动化研究所李林静研究员）
15：00-15：15	特
15：15-15：25	Ag
15：25-16：10	圆人主嘉
16：10-16：35	合
16：35–16：50	特
16：50–17：05	特
17：05–17：40	圆 主持人：国科大他山协会创始人 郑博元 嘉宾：国科嘉和合伙人 李斌 蚂蚁集团学术合作部高级总监 邵青 阿里云高校合作总监 郭伟杰 硒钼科技 CEO 向辉
17：40–17：50	闭幕仪式
18：00	晚餐

活动阶段	时间周期	主要内容
前期	策划阶段（11 月下旬）	完成策划案，修订赛事细则
	启动阶段（11.20-12.2）	组委会组建 发布报名推送，说明实训营及赛事情况
中期	实训营阶段（12.2-12.28）	4 周实训营共 8 次课程。4 次前沿讲座
后期	成果交流（12.28）	作品展示、课程回放发布、体系总结与案例沉淀
	后续支持	优秀作品纳入科教平台、持续维护与场景落地

Agent4S: The Transformation of Research Paradigms from the Perspective of Large Language Models

Boyuan Zheng[1,2*†], Zerui Fang[3,4†], Zhe Xu[1,5†], Rui Wang[3,1,2], Yiwen Chen[1,2], Cunshi Wang[6,7], Mengwei Qu[8,9], Lei Lei[10], Zhen Feng[11,12], Yan Liu[13], Yuyang Li[6,14*], Mingzhou Tan[15*], Jiaji Wu[16*], Jianwei Shuai[17,12*], Jia Li[4*], and Fangfu Ye[1,18,12*]

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ol of Physics and Microelectronics, China
Observatories, Chinese Academy of
Academy of Sciences, Beijing, China
te of Geochemistry, Chinese Academy China
cademy of Sciences, Beijing, China , China
versity, Wenzhou, Zhejiang, China
ces, Wenzhou, Zhejiang, China
y of sciences, Beijing, China
[14]College of Astronomy and Space Sciences, University of Chinese Academy of Sciences, Beijing, China
[15]Emotion Machine (Beijing) Technology Co., Ltd., Beijing, China
[16]School of Electronic Engineering, Xidian University, Xi'an, Shaanxi, China
[17]Oujiang Laboratory (Zhejiang Lab for Regenerative Medicine, Vision and Brain Health), Wenzhou, Zhejiang, China
[18]School of Physical Sciences, University of Chinese Academy of Sciences, Beijing, China
*Corresponding authors are as follows: Fangfu Ye(fye@iphy.ac.cn), Jia Li(lijia@ime.ac.cn), Yuyang Li(liyuyang22@mails.ucas.ac.cn), Jianwei Shuai(jianweishuai@xmu.edu.cn), Mingzhou Tan(SwanLab.cn), Jiaji Wu(wujj@mail.xidian.edu.cn), Boyuan Zheng(zhengboyuan17@mails.ucas.ac.cn)
†Contributed equally (Co-first authorship)

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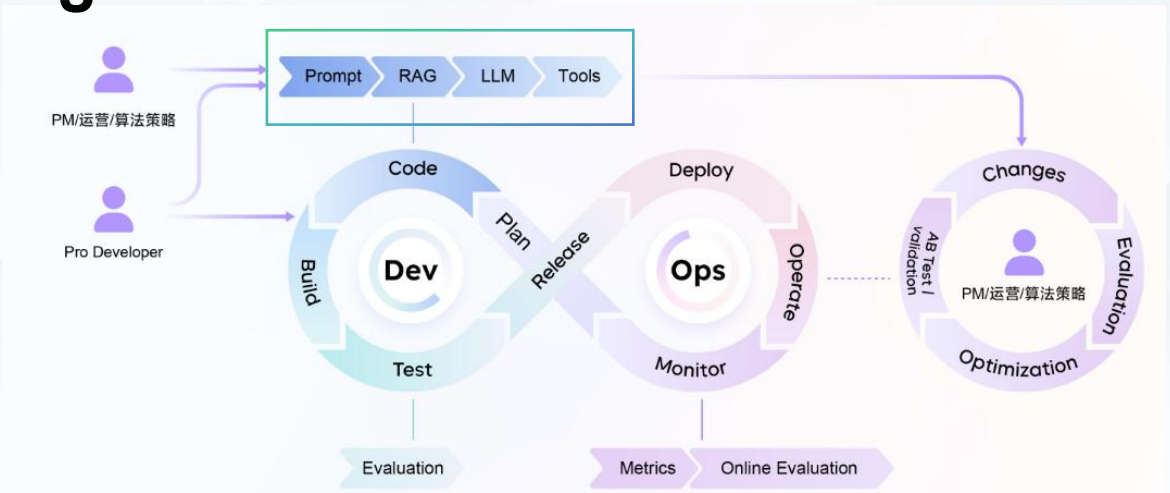
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智能体开发生态+
每日Arxiv自动PPT生成与讲解+智能笔记系统等





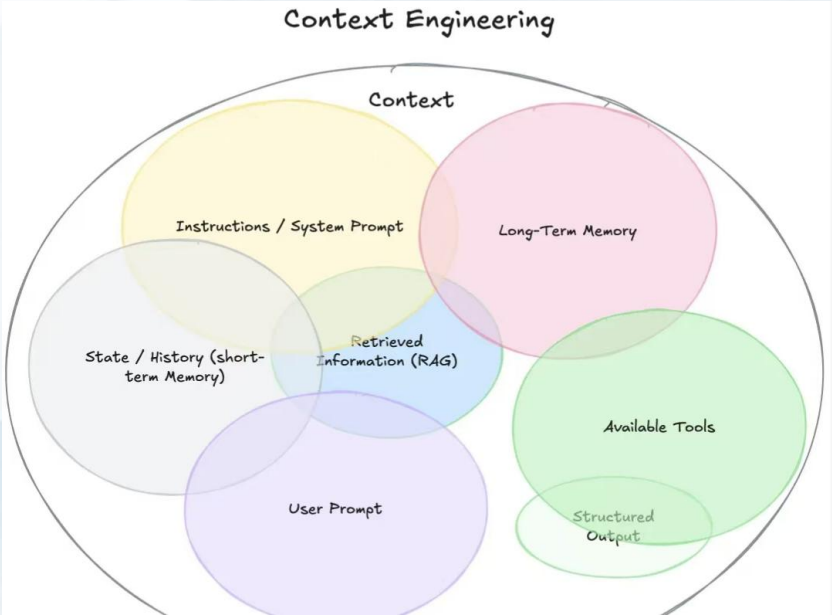
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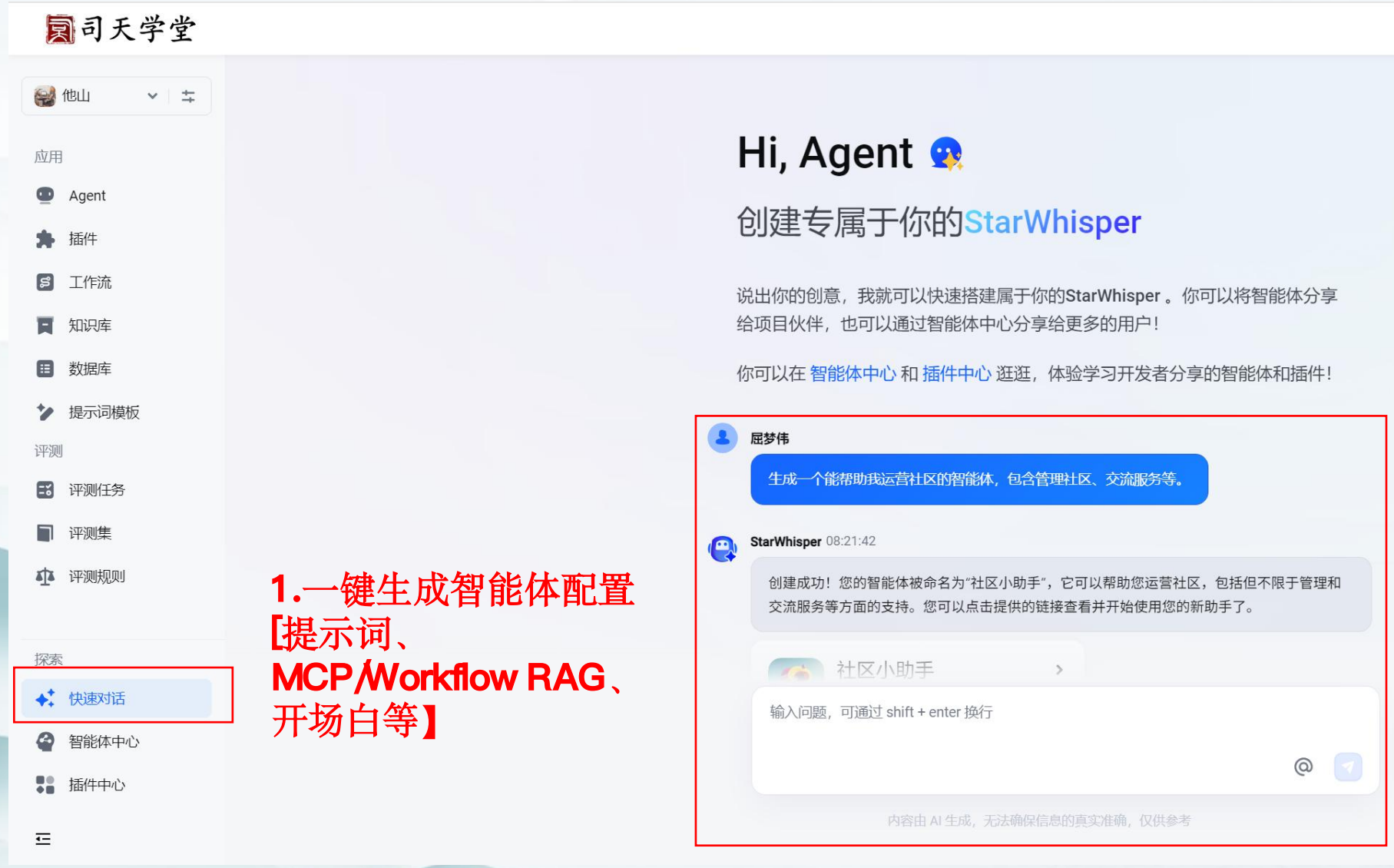


基于HiAgent的
高度集成上下文工程开发系统

开发者社区 阶段	核心上下文
Dev（智能体开发者）	**1. User Prompt:** 「开发科教科研智能体，支持知识讲解 + 交互练习 + 错误反馈」 **2. RAG:** 「学科知识库（教材 / 文献标）+ 上轮 Ops 的用户学习问题（反馈）」 **3. LLM Instructions:** 「符合学段目标，交互逻辑适配认知规律」 **4. Tools:** 「科教科研交互引擎、知识图谱工具、多媒体集成组件等」
Ops（专家系统）	**1. System Prompt:** 「用户学习数据+ Dev 的智能体功能逻辑（如知识点层级）」 **2. RAG:** 「教学法知识库（如建构主义策略）+ Dev 的技术方案（智能体设计文档）」 **3. LLM Instructions:** 「分析用户学习痛点，输出智能体优化方向」 **4. Tools:** 「历史用户学习规律（如常见认知误区）+ 上轮 Ops 的优化方案（如增加图解辅助）」



StarWhisper AgentBuilder



1.一键生成智能体配置【提示词、MCP/Workflow RAG、开场白等】

StarWhisper AgentBuilder





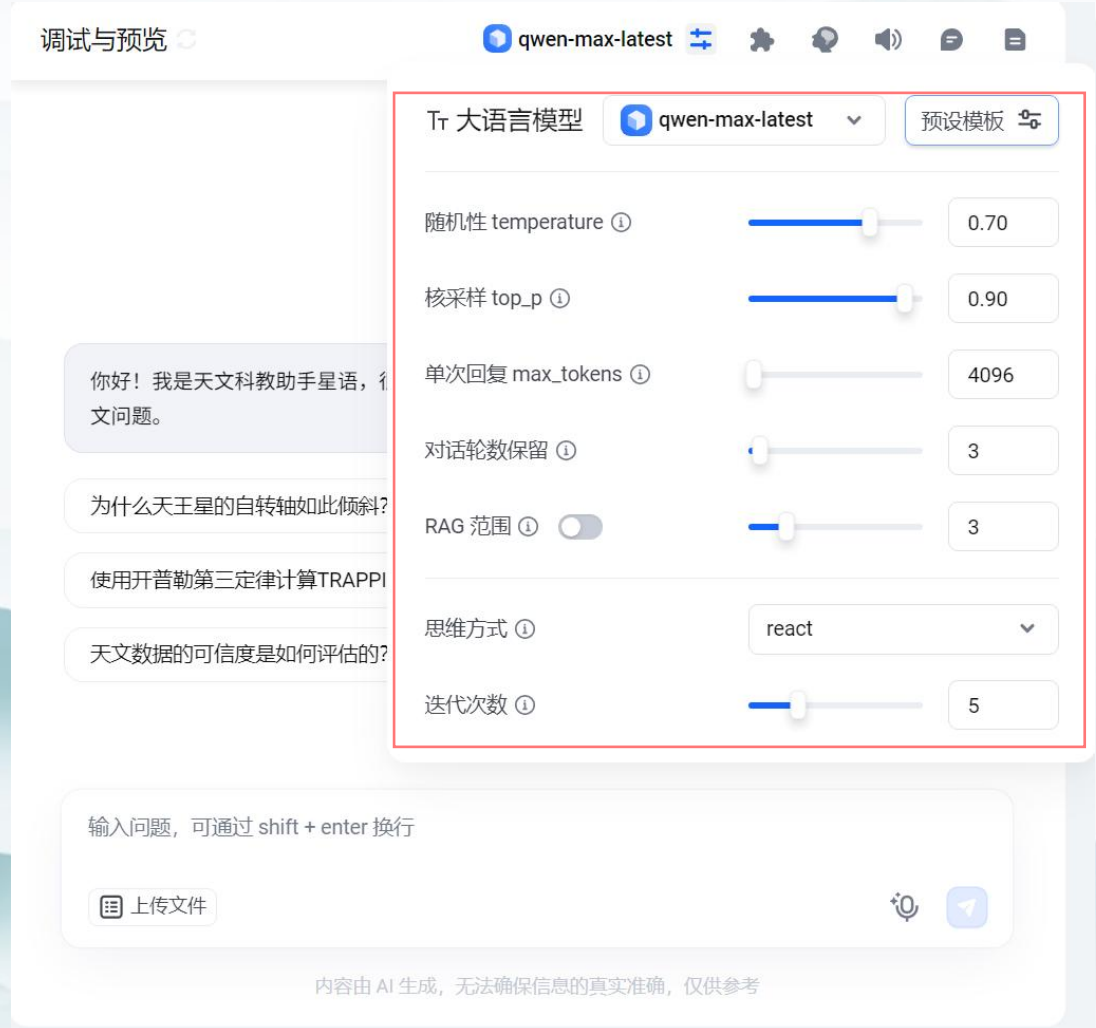
4.知识库加载



5.其它服务选项[标注引用、语音交互、安全审查等]

StarWhisper AgentBuilder

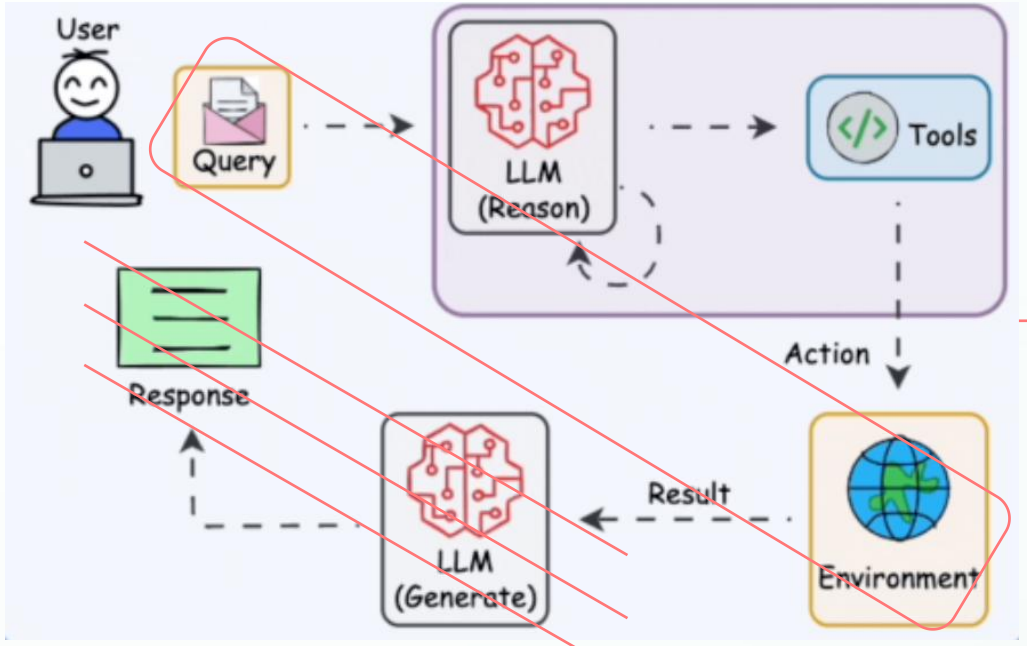
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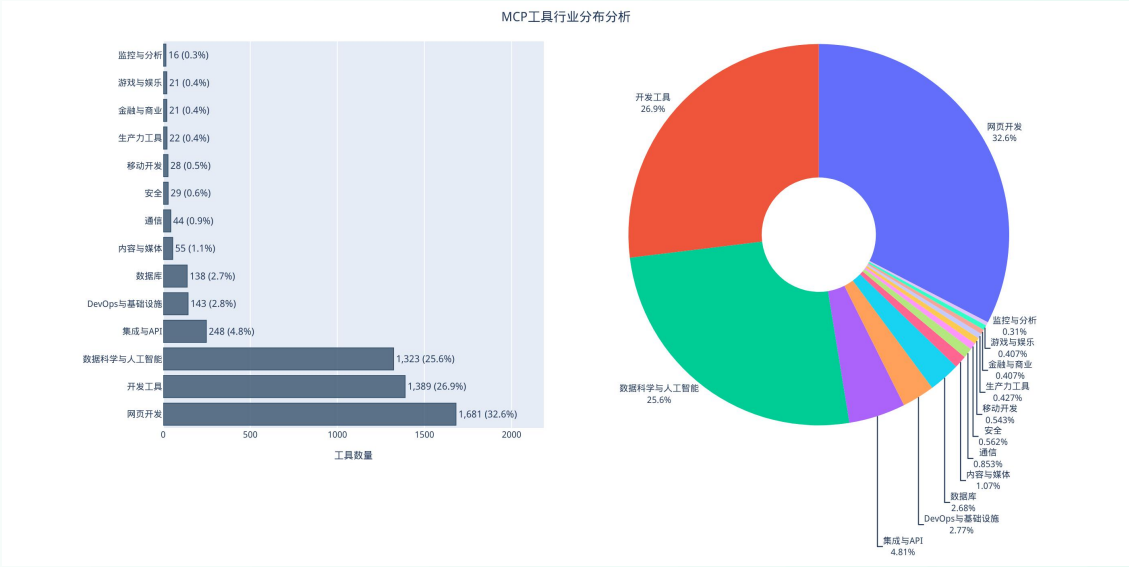
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AI Scientist



ReAcT框架



他山MCP生态[已评测2万，并筛选5千可用]

如何扩展应用场景？
[链接领域模拟仿真软件、实验仪器]



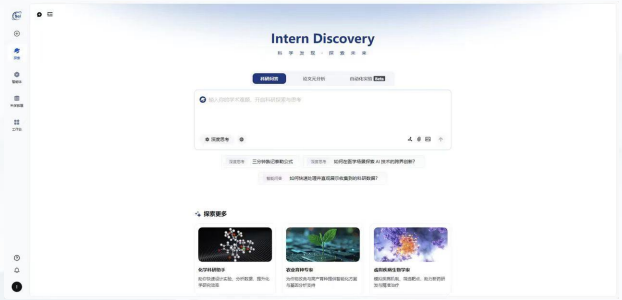




http节点[插件/MCP]链接规范化的软硬件API：**可标准化接受请求与返回执行状态**

AI Scientist

Intern Discovery





SciMaster





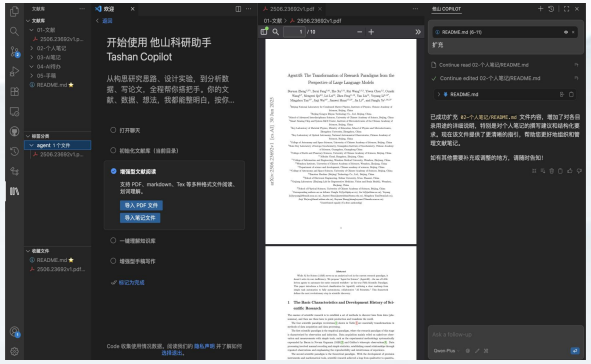
ScienceOne





国科大AI科教平台





目前AI Scientist平台布局基本上是成熟通用的**Deep Research**+托管部署的**AI Scientist**案例

国科大AI科教平台以**1.2亿**篇文献支撑、开发与托管全支持、支持**Vibe Research**具备优势

群聊：AI 科教平台用户反馈群

Vibe Research：以研究思维为内核的个性化可信知识发现系统

覆盖全流程的信息来源

外部

- 论文库
- 专利库
- 开源代码库
- 公开数据集

内部

- 实验数据
- 筛选后的资料库
- 研究与决策手稿
- 研发代码

专业的数据处理与知识发现引擎

- 工具库
- 工具调用中枢

单智能体层

- 有研究思维的上下文工程
- 思维链
- 知识图谱

多智能体层

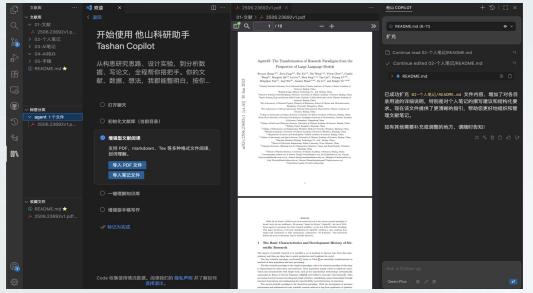
- 多智能体协作网络

主动学习　　实践与迭代

多维判断　　思维范式

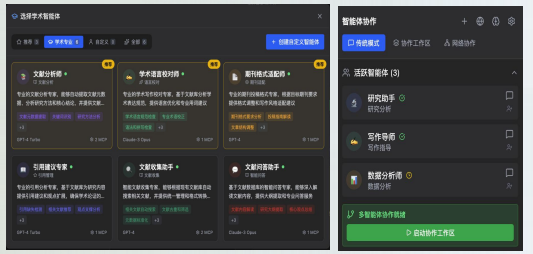
人机协同的交互前端

无缝衔接人工生产界面



工具定义入口

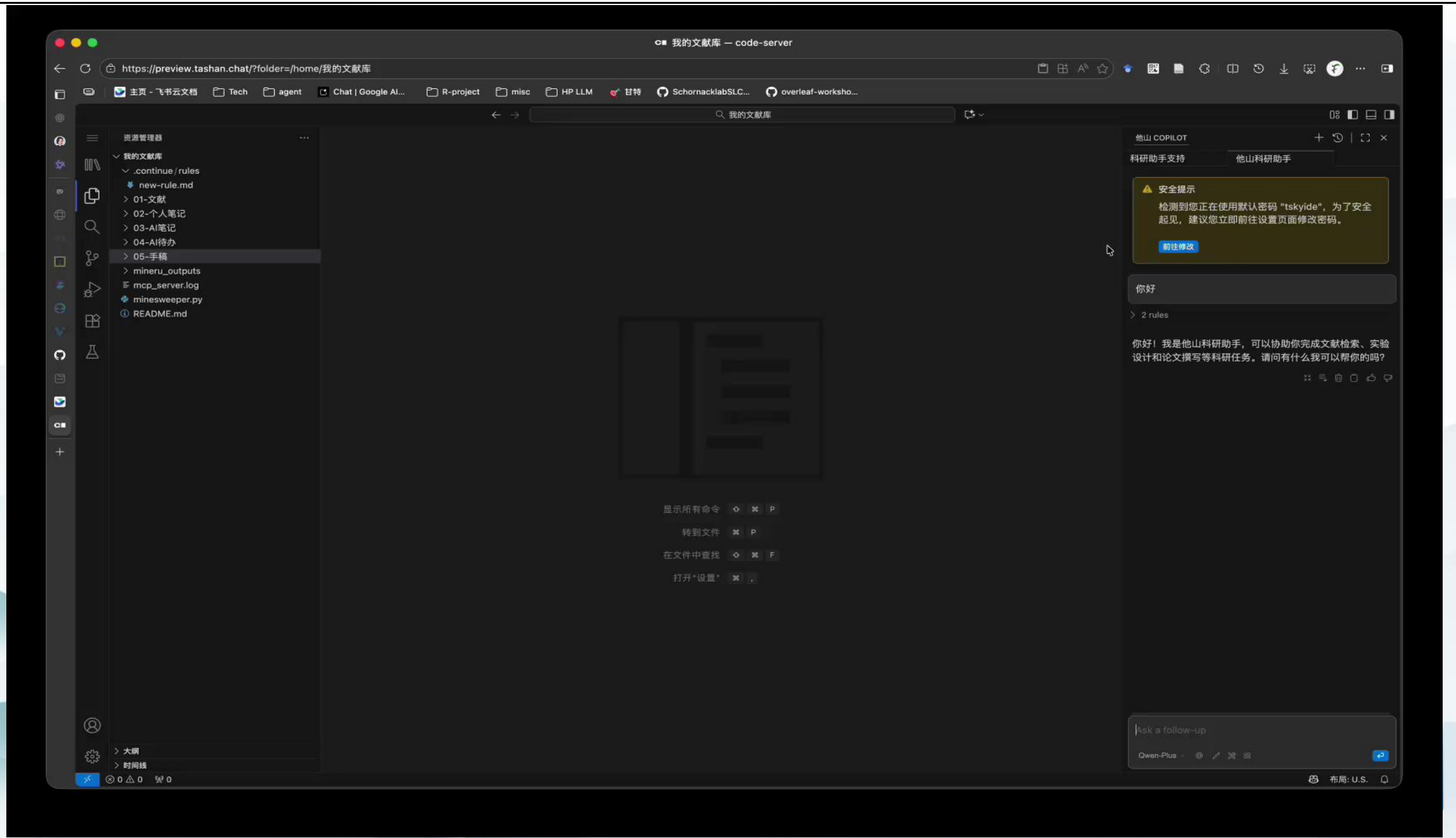
AI协作窗口



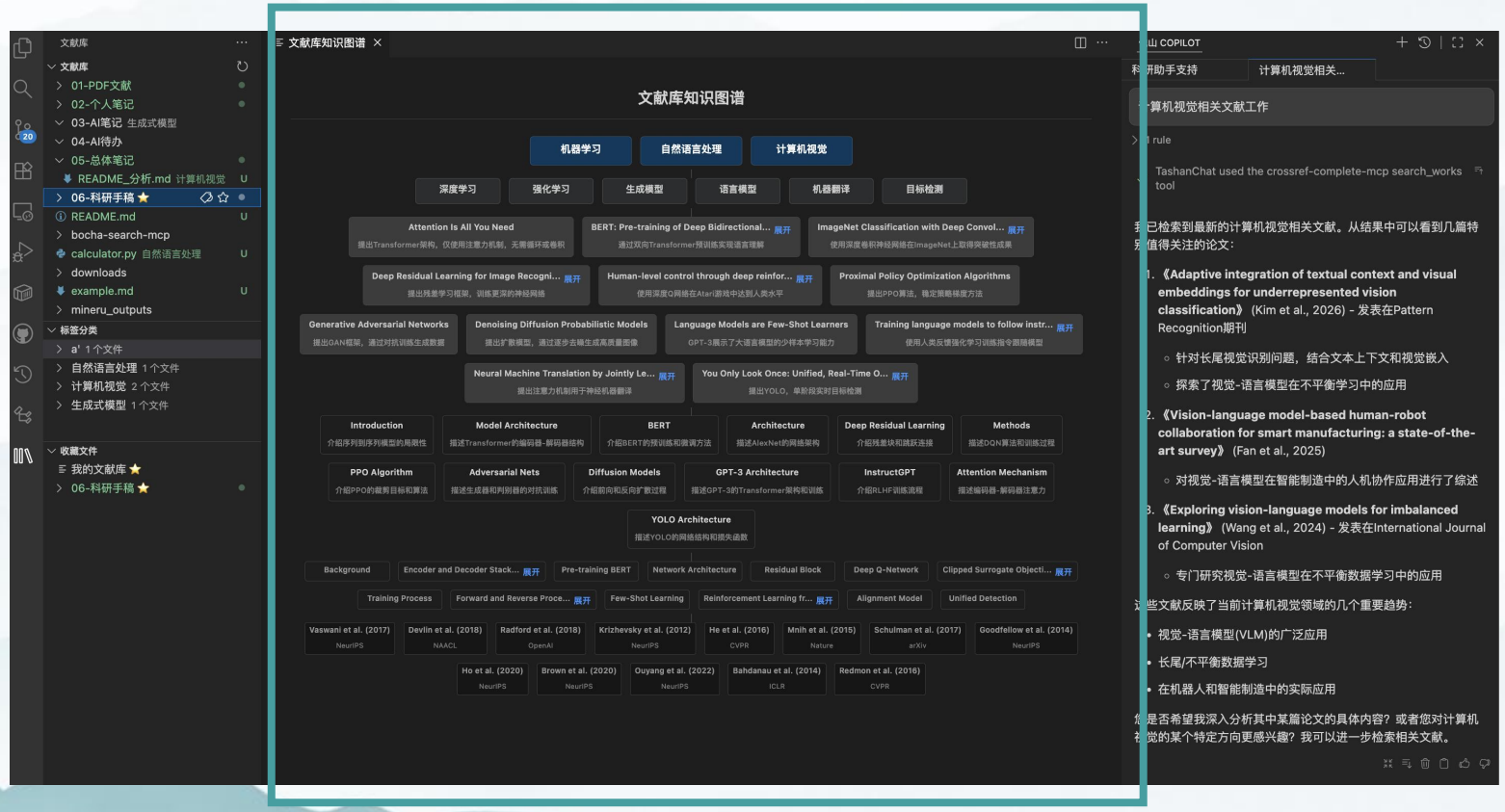
满足用户的可靠信息整合需求

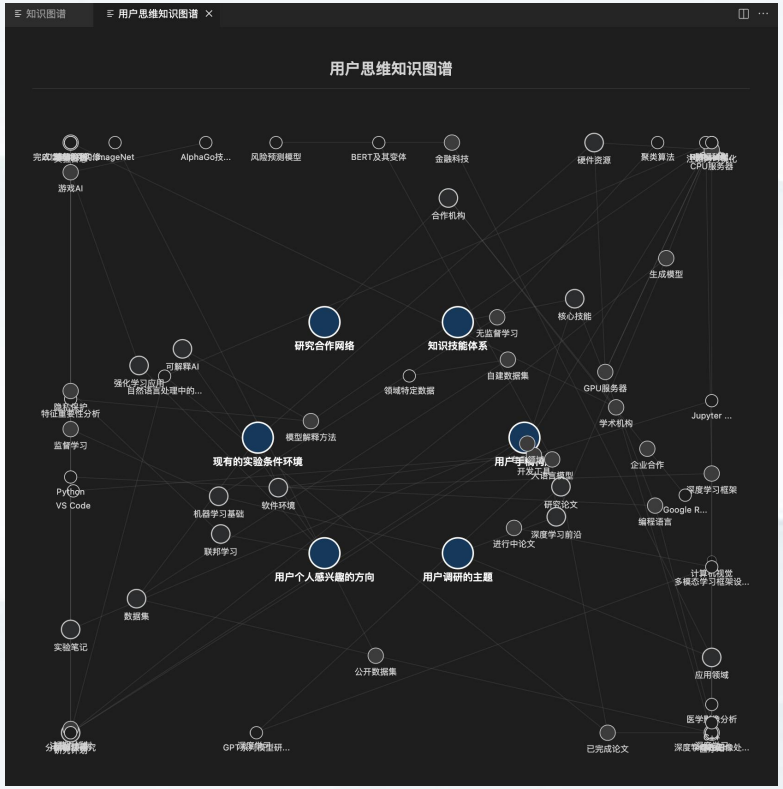
完善　　个性化迭代

Vibe Research： AI 原生



Vibe Research：主动追踪





文献库知识图谱

用户个性化知识图谱

集成认知过程建模、用户行为理解，是持续学习和进化的关键引擎

Vibe Research：垂域生态

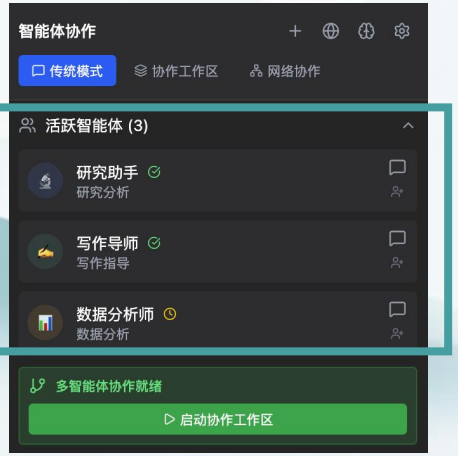
论文写作



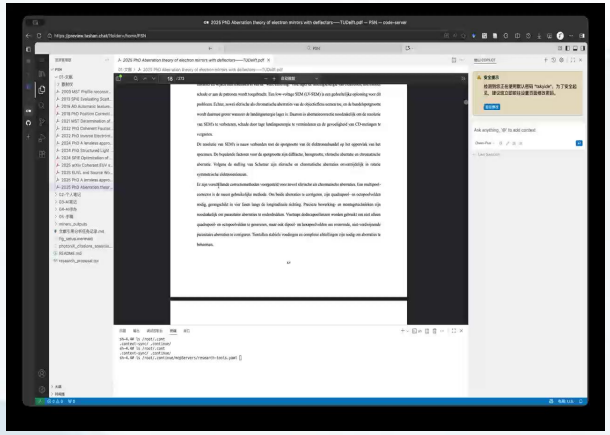
论文校对

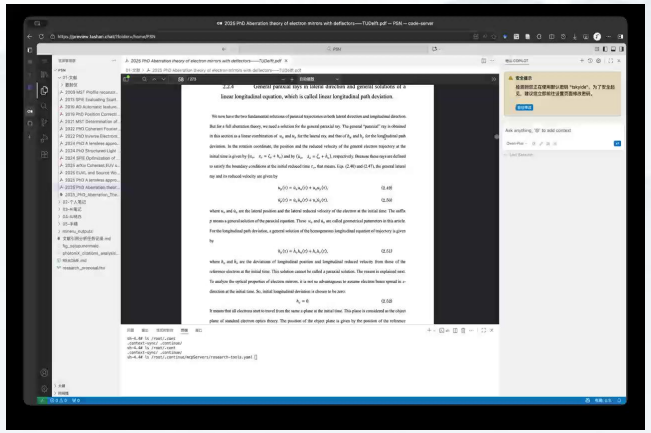


文献阅读



多智能体协同





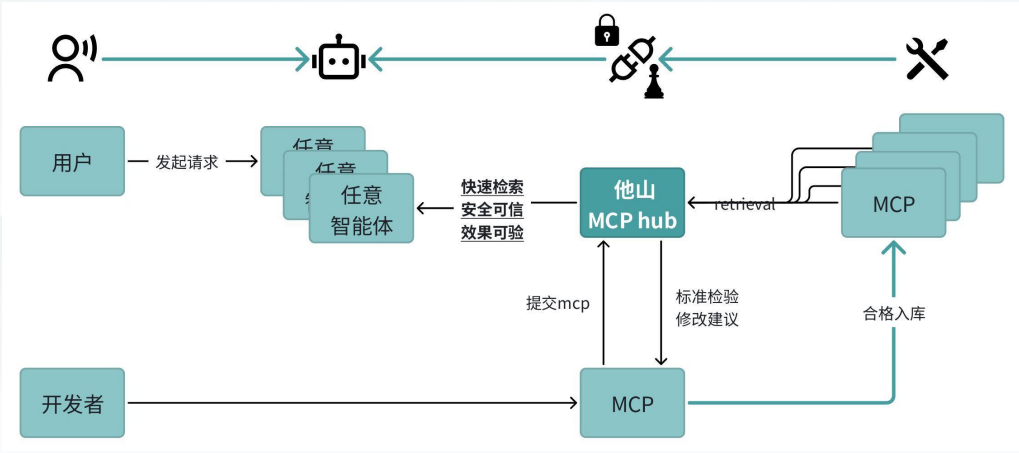
以领域需求为起点，提供低门槛的生态接入机制，激发并承载垂域社区集体智慧

Vibe Research： MCP评测

背景

随着 MCP 生态的扩张，大模型可以实用的工具数量增至数万种，“规模悖论” 正凸显：工具越多，调用效率越低。

1. 上下文 Token “雪崩”：按照传统模式，大模型需提前加载所有工具的完整描述
2. 选择准确率 “跳水”：当大模型面对数千个工具时，大量冗余信息会干扰判断



•解决方案

1. 可信认证体系：他山 MCP 评测智能体，搭建起 "信息抓取 - 服务部署 - 性能评测 - 动态检索" 的全流程自动化闭环。
2. 智能中介：他山将Graph RAG 技术应用到通过他山 MCP 评测智能体认证的数据集，构建了MCP hub 智能中介服务，目标为大模型/智能体提供安全可信赖、效果可验证，同时可以快速检索适合当前情境需求工具的统一接口。
3. 知识图谱：深度依托他山 MCP 评测智能体和已积累的 MCP 服务器数据集，将分散在不同 MCP 生态中的工具信息、场景需求、用户反馈等碎片化数据，转化为结构化、关联化的知识网络。

阿里百炼 他山认证专区　　MCP Graph RAG　　5200+ MCP 数据集

以评测智能体筑牢质量基石，用智能中介打通效率堵点，靠知识图谱形成优化闭环

https://github.com/TashanGKD/MCP-

Vibe Research： MCP评测及阿里云科学智能专区

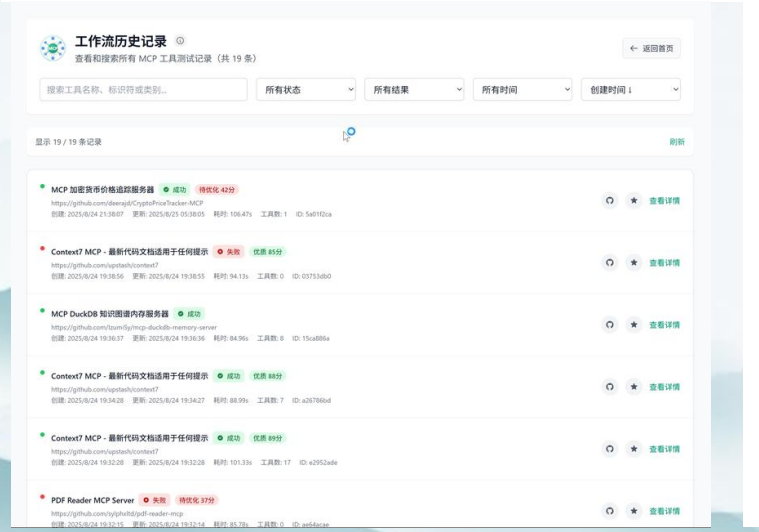


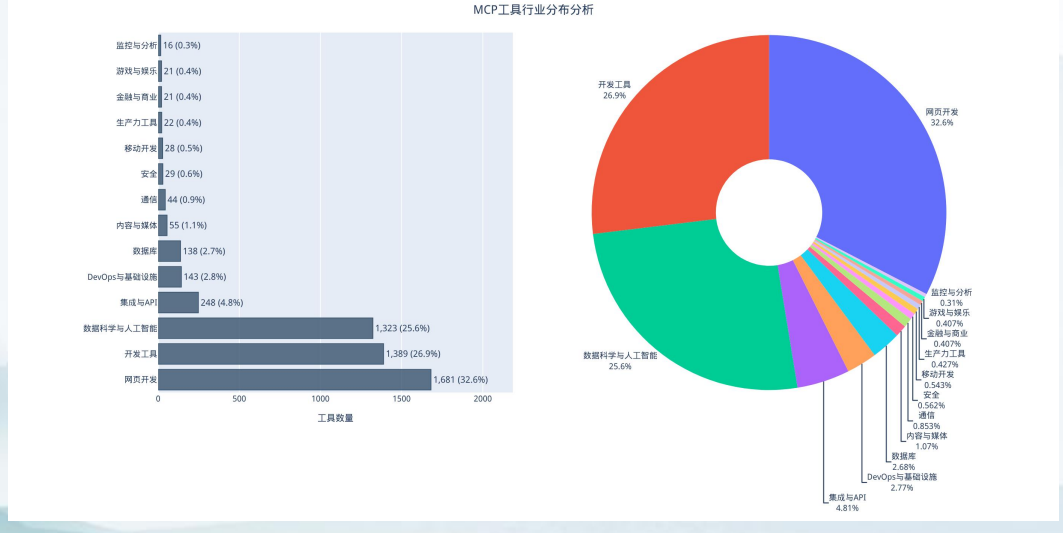


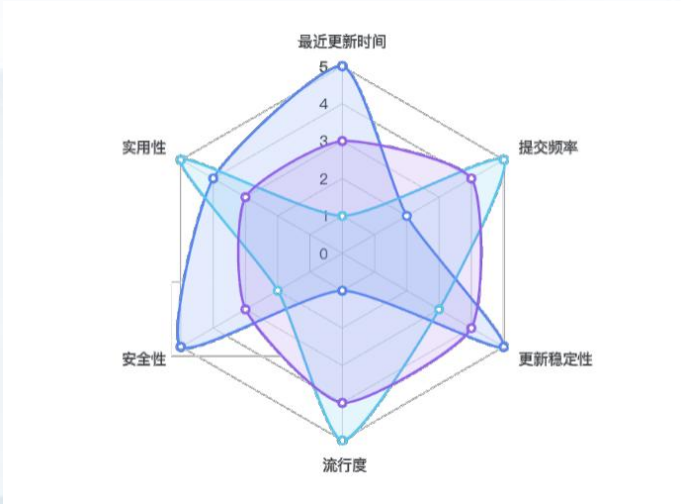


携手云工开物发布云市场科学智能**MCP**专区

包含天文、地学、生物、材料、海洋等

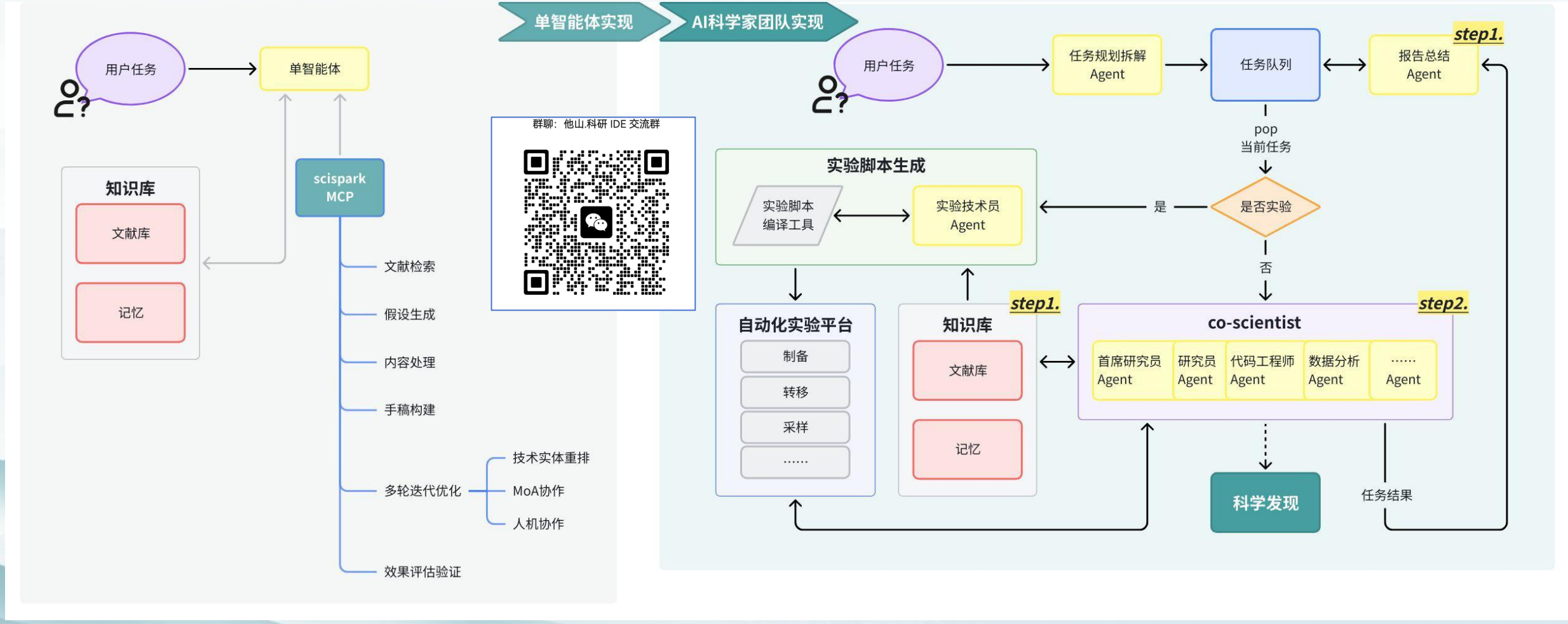






评测系统已构建起包含超过5200个MCP服务器的庞大数据集并开放服务，具备对多MCP社区实时抓取、即时评测、动态入库的能力。面向行业，梳理技术脉络，挖掘跨领域协同机遇

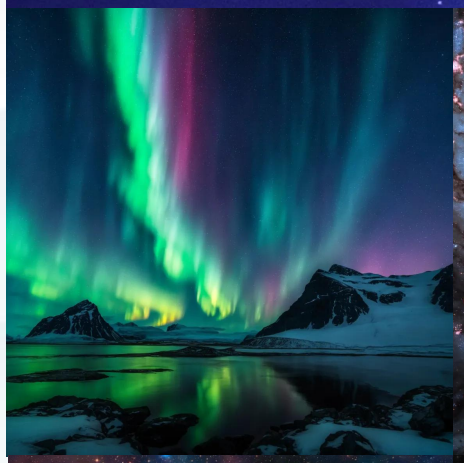
Vibe Research：技术框架



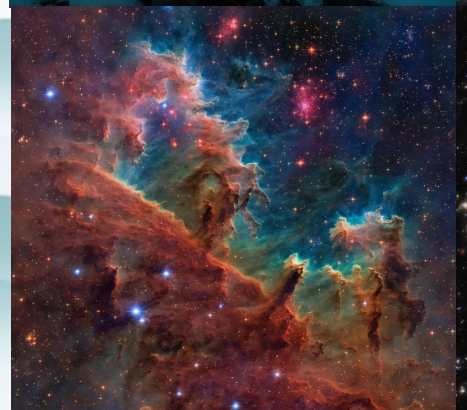
24年05月·首个AIGC科教绘图征集















25年09月·首个AIGC科教视频征集





25年10月·首个AIGC科普科教工作流征集

主办单位：ModelScope 他山 TA SHAN 通义万相　合作单位：中国科学院物理研究所 Institute of Physics CAS 上海天文馆 Shanghai Astronomy Museum 首都体育学院 体育人工智能研究院 Institute of Artificial Intelligence in Sports 中国科学院大学 天文与空间科学学院 University of Chinese Academy of Sciences School of Astronomy and Space Science ...

期望： 降低**教学演示视频**的沟通制作成本及门槛

征集： 具备**一定科学连贯性**的视频生成智能体/工作流

效果： **30s**左右的科普科教视频素材

达成： 需求输入→素材剧本→分镜图片→首尾帧视频

一级赛道	二级赛道	科普科教方向
赛题	微观原理	微纳尺度反应	量子运动、微观化学反应机理
		细胞与生命科学	细胞与分子过程、生理功能区域
	宏观演化	天文学	天体演化、宇宙大尺度结构介绍
		地学与生态学	地球演化、极端气候还原
	通识讲解	数字人健康教练	健身动作演示、健康知识科普
		大国重器	科技、能源、航天、军事等技术装备

*具体赛题以正式发布为准

工作流案例：

《智绘科普》中部分示例



魔搭小有可为公益大赛入围,由他山AIGC团队制作

AIGC科普科教视频实现思路

AIGC科普视频制作

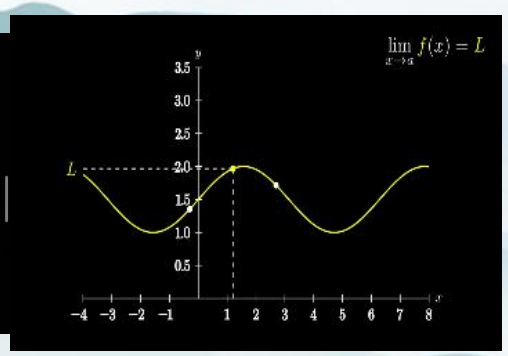
- 思路设计——集思广益
- 文案撰写——基于星语模型撰写，科学指导审查，文案编辑修改
- 分镜制作
  - 分镜设计-提示词撰写：编导设计、LLM润色
  - 分镜制作
    - 基于星语 || 绘卷AIGC文生图工具
    - 真实科学仪器图像
- AIGC视频制作
  - 关键帧\首尾帧生成视频AIGC工具
  - 仿真动画使用AIGC工具添加效果
- 视频剪辑——编导剪辑

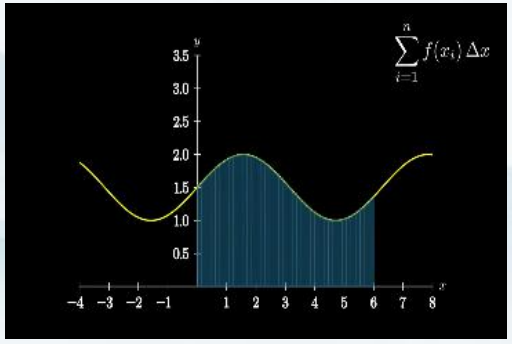
Q1：如何解决AIGC文生图工具科学性不足的问题?

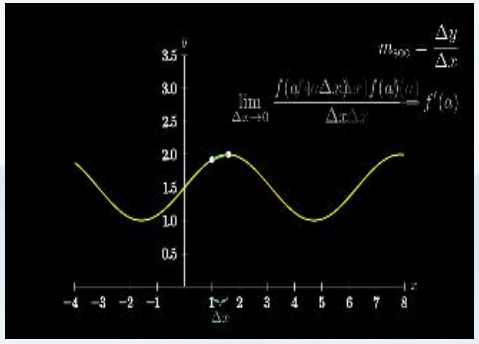
Q2：如何解决复杂技术原理难以通过AIGC视频生成工具直接生成的问题?

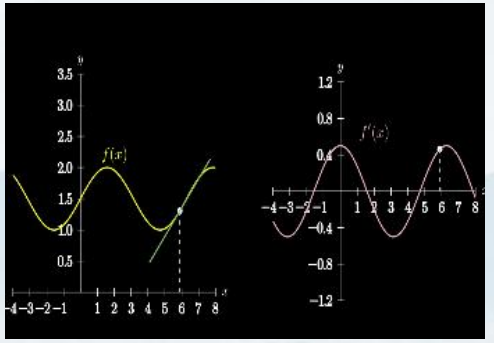
工作流总览（可直接映射为节点）

0. 参数收集 → 1. 风格卡生成 → 2. 教学大纲 → 3. 逐镜头分镜 → 4. Manim API 映射 → 5. 场景级代码生成（多并行）→ 6. 合并脚本 → 7. 静态代码审查/修复 → 8. 格式化 → 9. 试编译与日志解析 → 10. 质量验收 → 11. README 生成与打包










将银心黑洞的秘密传递给我们
They pass on the secrets of the galactic center black hole