penAI

o1-preview

Model

GPT-4o
Great for most tasks

o1-preview
Uses advanced reasoning

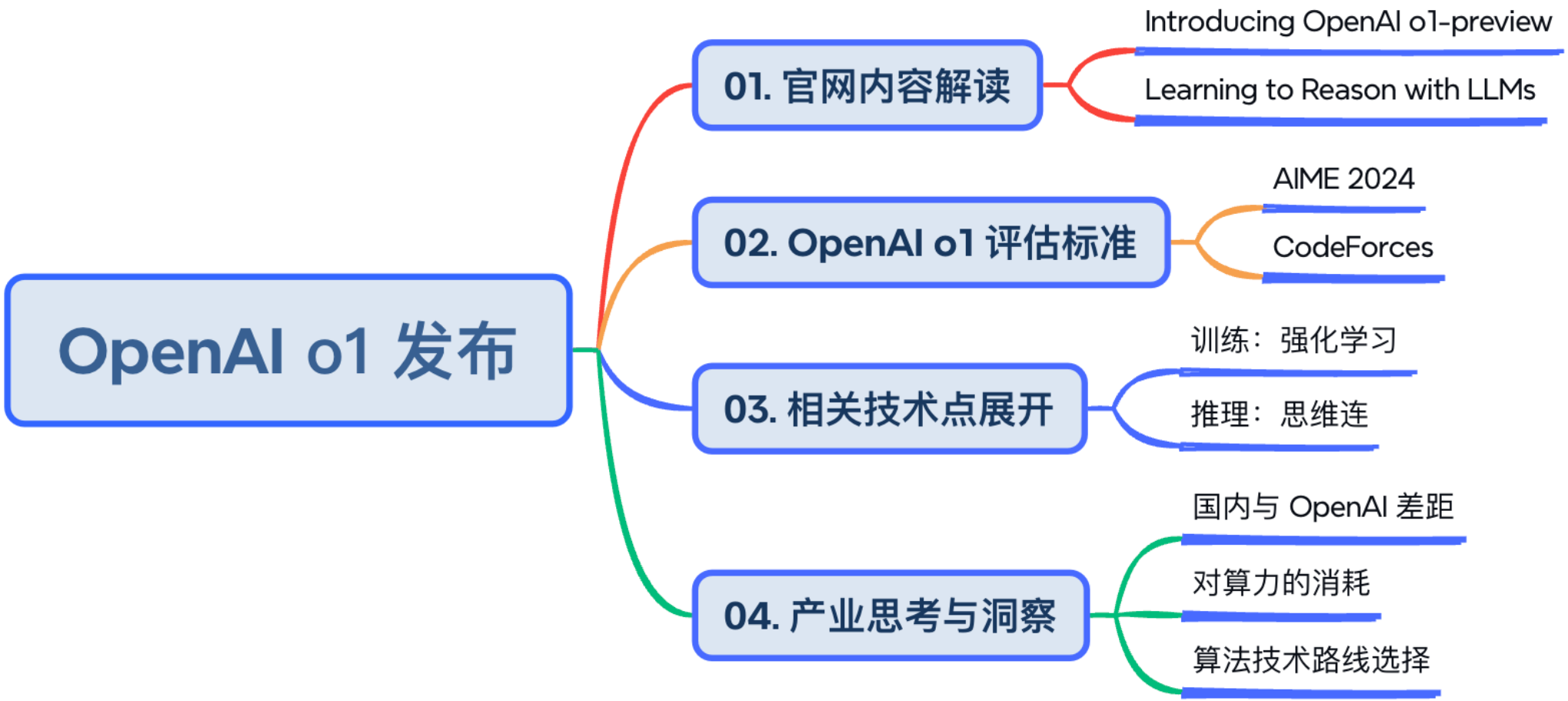
o1-mini
Faster at reasoning

More models

Temporary chat

1

视频内容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Learning to Reason with LLMs
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AIME 2024
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国内与 OpenAI 差距
对算力的消耗
算法技术路线选择

01

OpenAI o1 官网解读

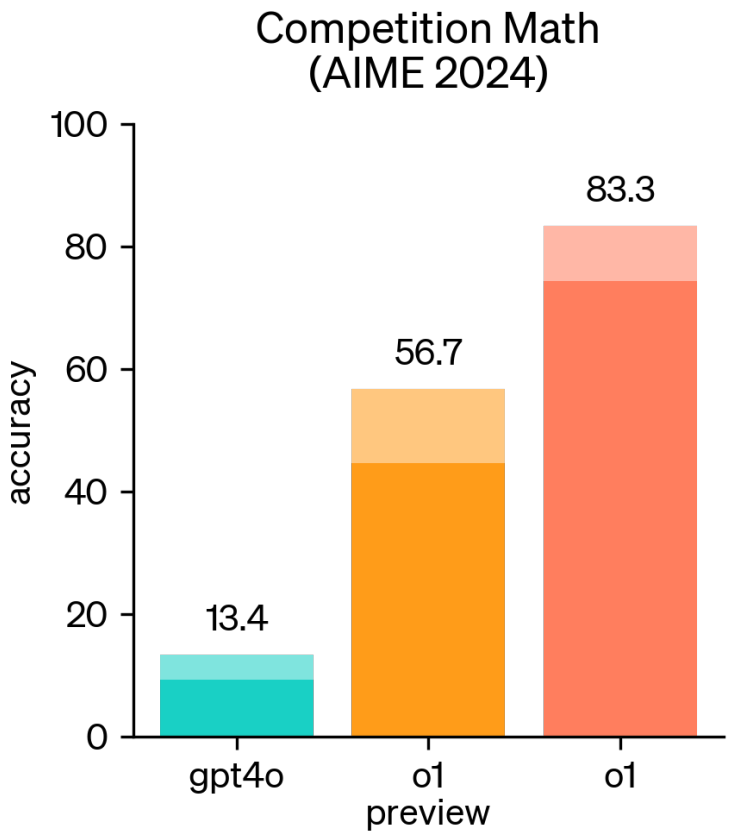
官网链接

1. https://openai.com/o1/
2. https://openai.com/index/introducing-openai-o1-preview/
3. https://openai.com/index/openai-o1-mini-advancing-cost-efficient-reasoning/
4. https://openai.com/index/learning-to-reason-with-llms/

02

OpenAI o1 评估标准

评估标准


Competition Math
(AIME 2024)
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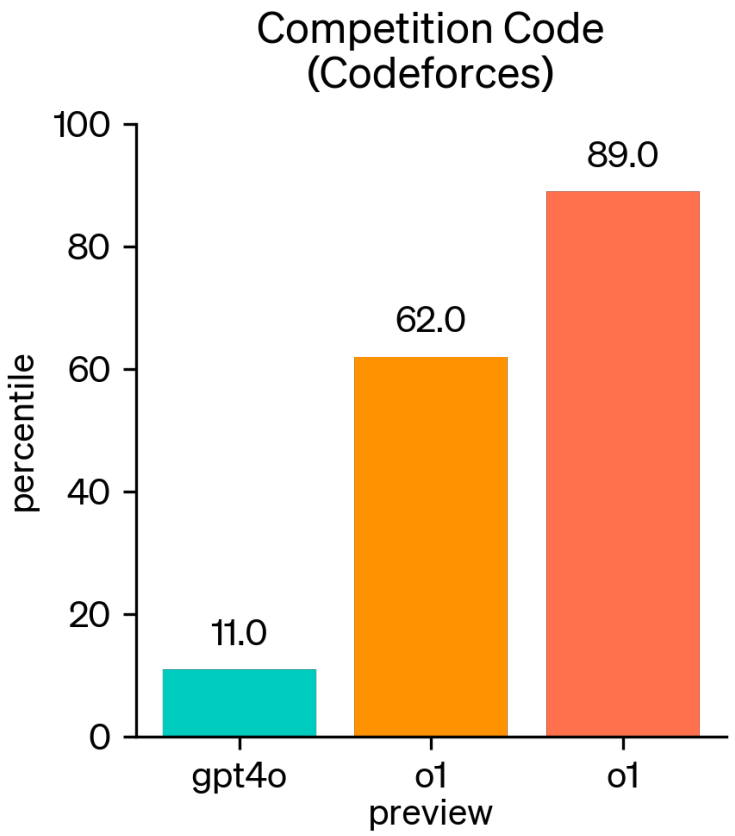
13.4
56.7
83.3
gpt4o
o1
preview
o1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(Codeforces)
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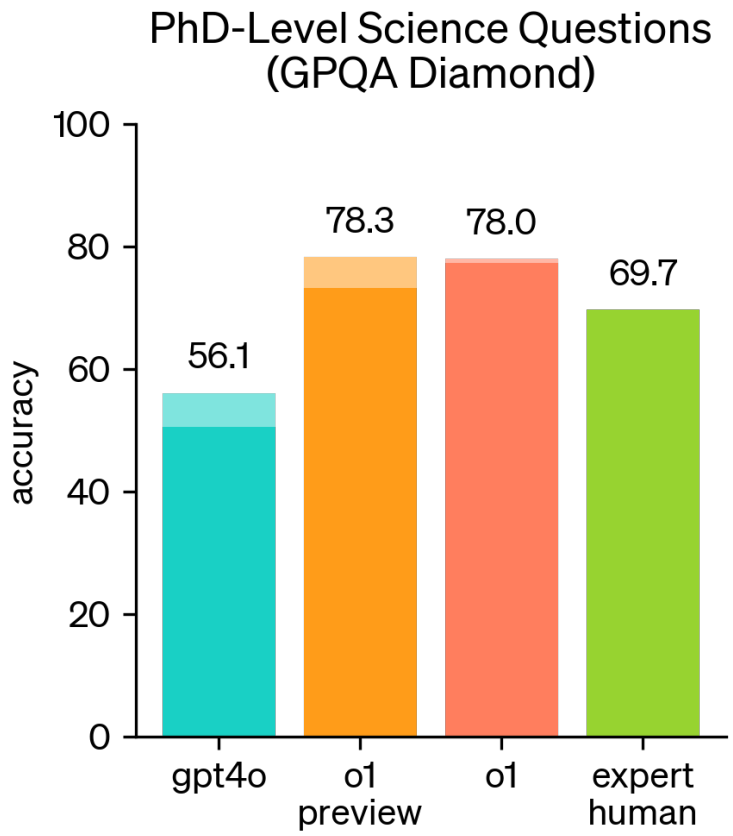
gpt4o
o1
preview
o1


PhD-Level Science Questions
(GPQA Diamond)
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80
60
40
20
0
56.1
78.3
78.0
69.7
gpt4o
o1
preview
o1
expert
human

AIME 2024

1. 美国数学邀请赛（American Invitational Mathematics Examination）简称为AIME，是介于AMC10、AMC12及美国数学奥林匹克学术活动（USAMO）之间的一个数学学术活动。

https://artofproblemsolving.com/wiki/index.php/2024_AIME_I

CodeForces

1. CodeForces 一个提供在线编程评测系统的俄罗斯网站。该网站由一群来自ITMO大学的程序员创建并维护。

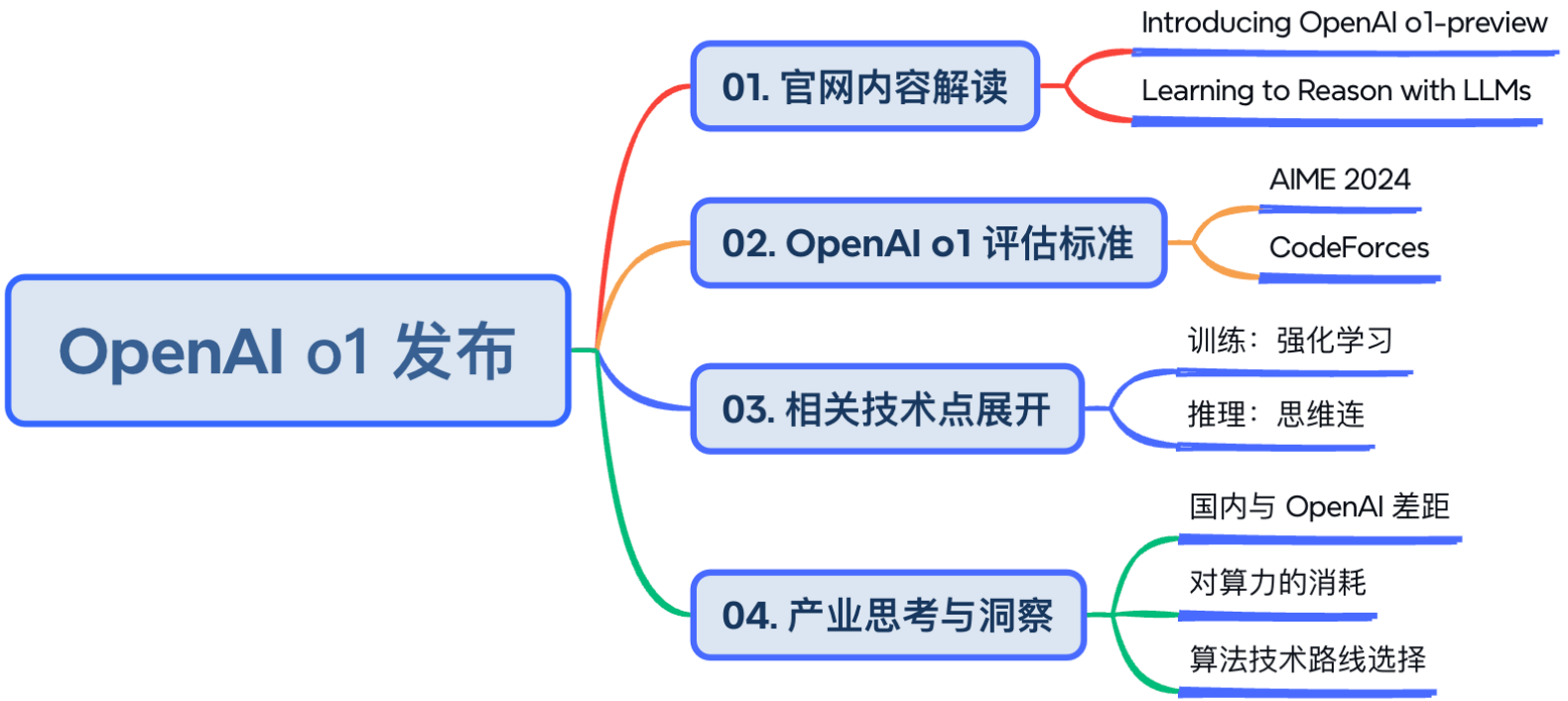
https://codeforces.com/

03

强化学习 RL
思维链 CoT

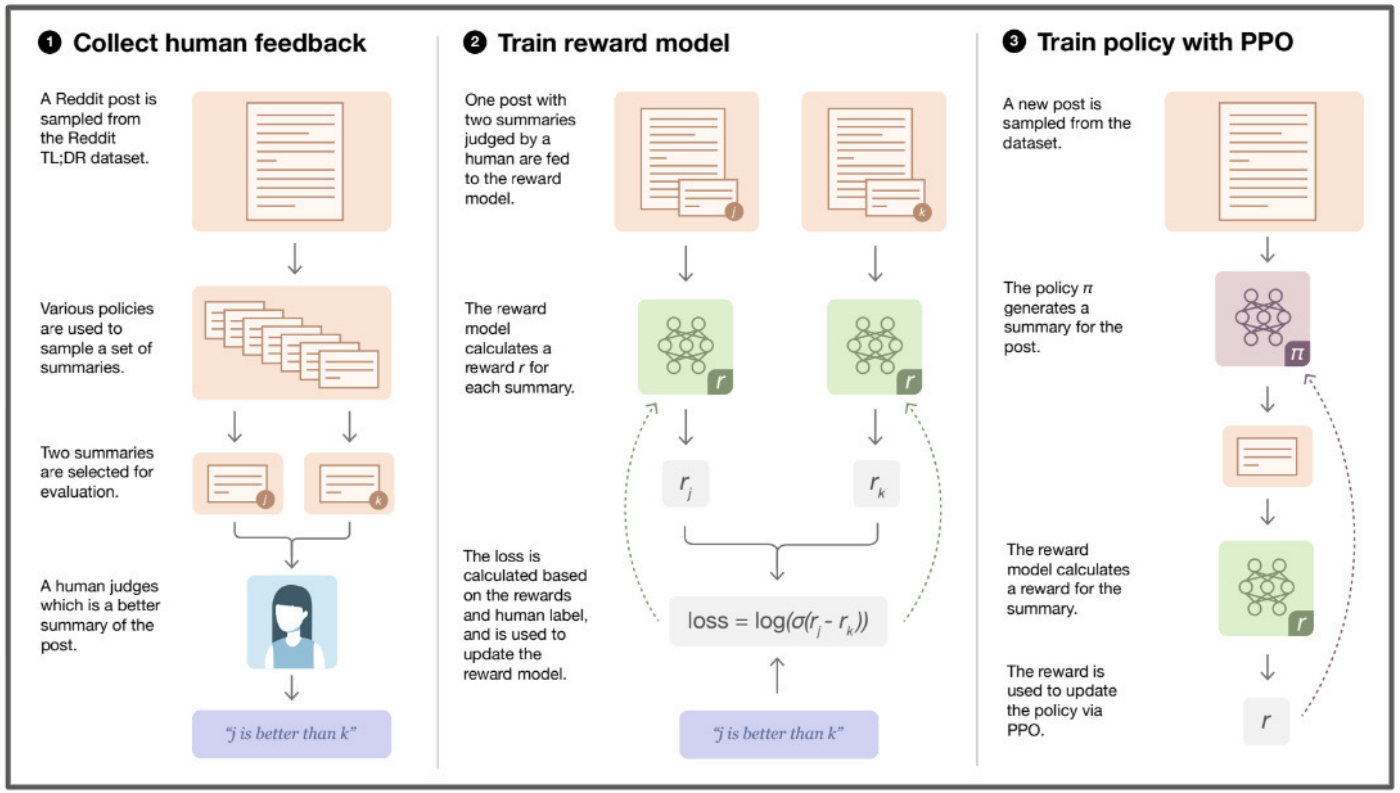
强化学习 Reinforcement Learning

1. ChatGPT： RLHF
2. LLAMA3.1： DPO
3. Quiet-STaR

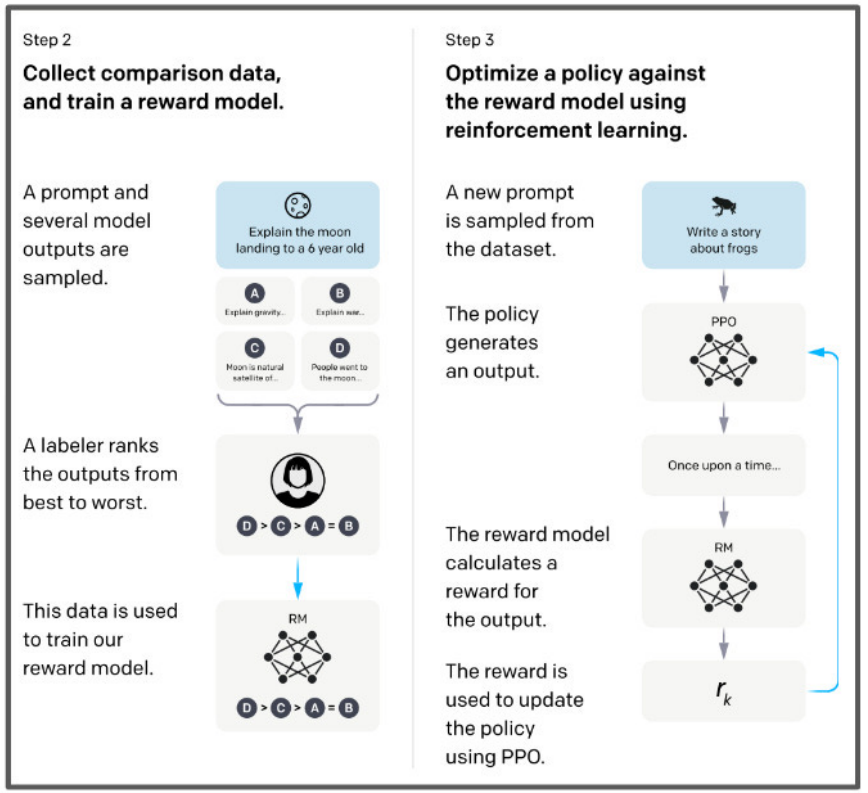


1、ChatGPT

RLHF in [1]

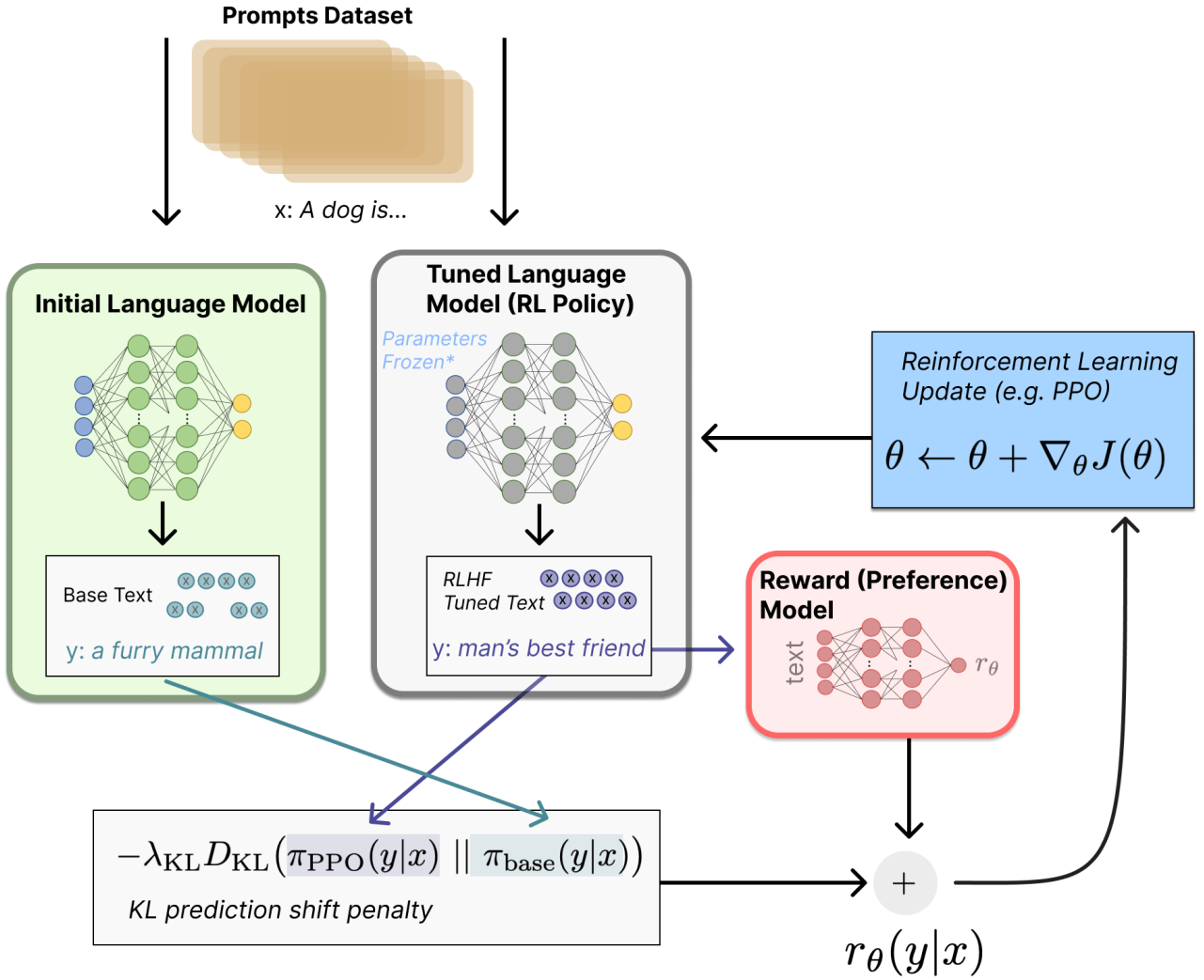


RLHF in [2]



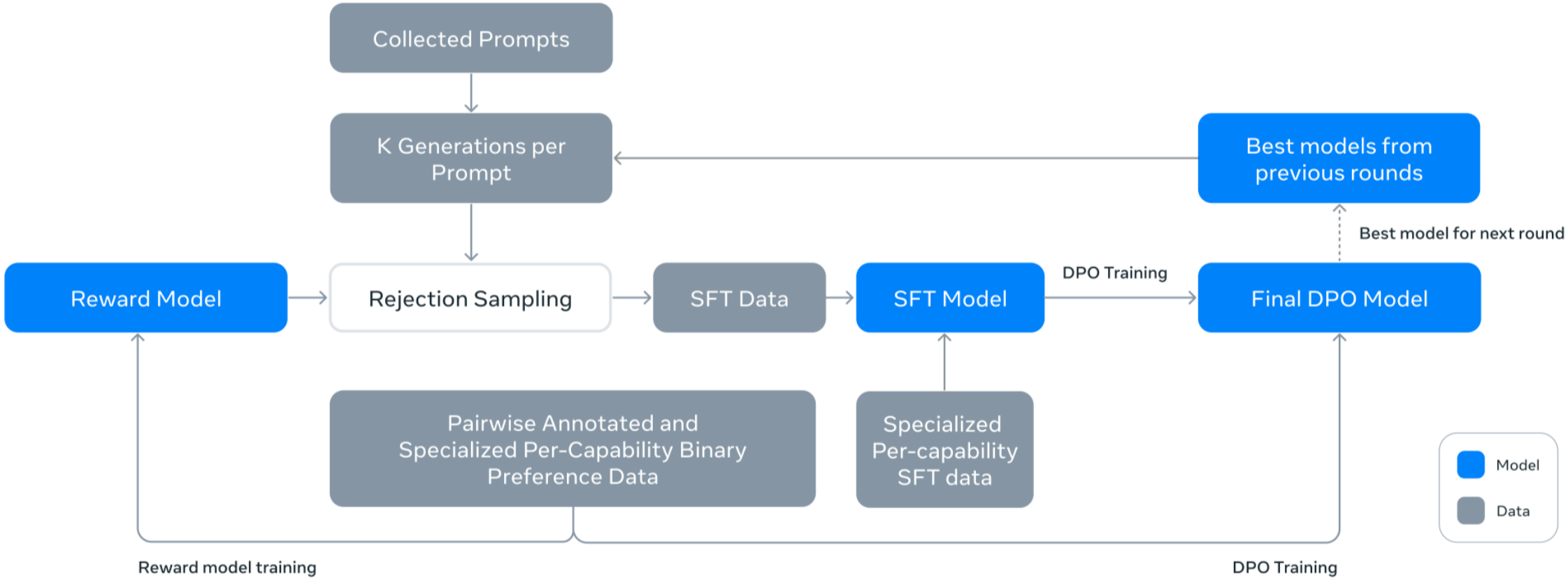
1、ChatGPT

1. **第一阶段：**冷启动阶段的监督策略模型
2. **第二阶段：**训练奖励模型（Reward Model，RM），通过人工标注数据训练回报模型
3. **第三阶段：**采用 PPO（Proximal Policy Optimization，近端策略优化）强化学习来优化策略。



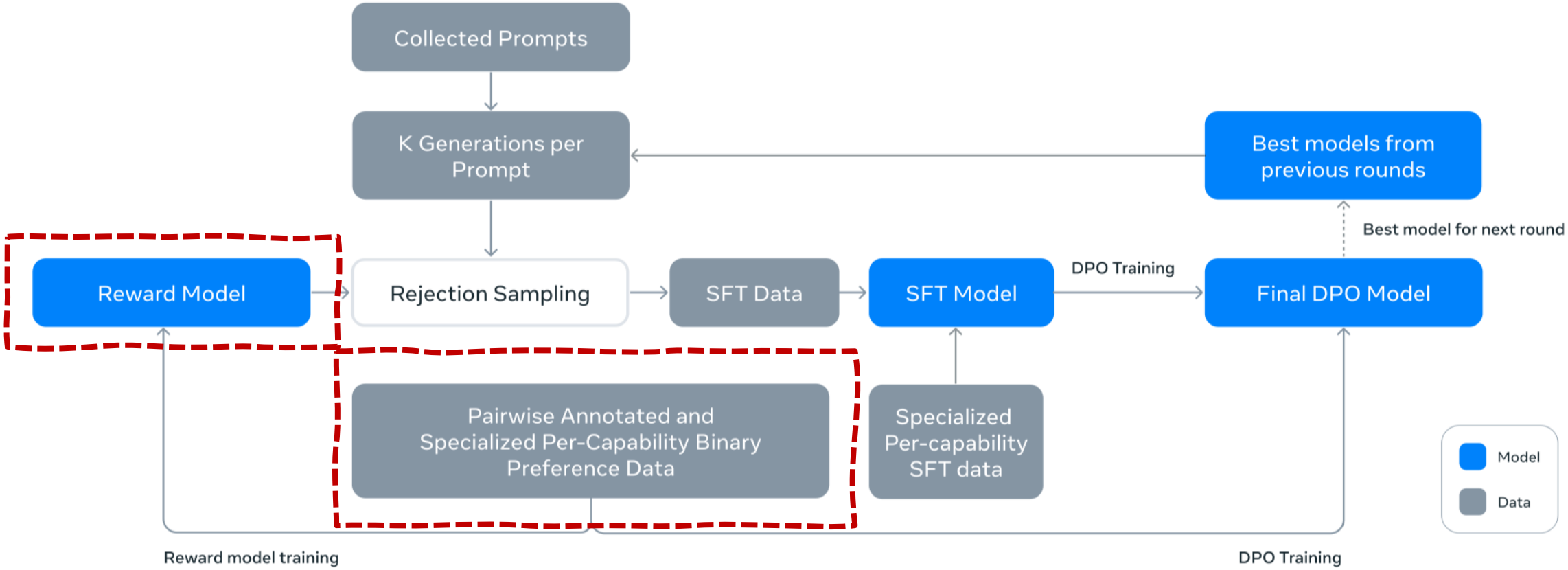
2、LLAMA3.1 后训练过程

- 通过多轮对齐来完善 Chat 模型，基于监督微调（SFT）、拒绝采样（RS）和通过 DOP 直接优化偏好。



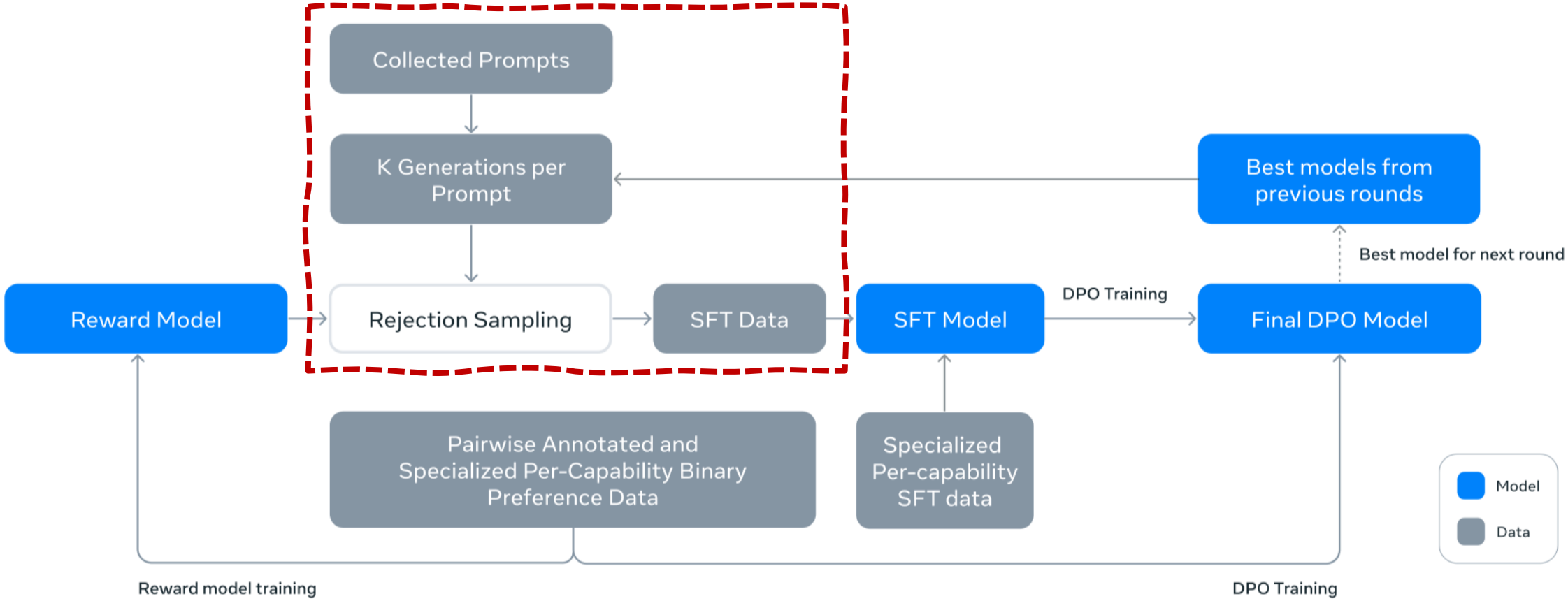
2、LLAMA3.1 后训练过程

1. **训练 RM 模型：**人工标注数据训练 RM 模型，用来评价 <prompt, answer> 数据对质量；



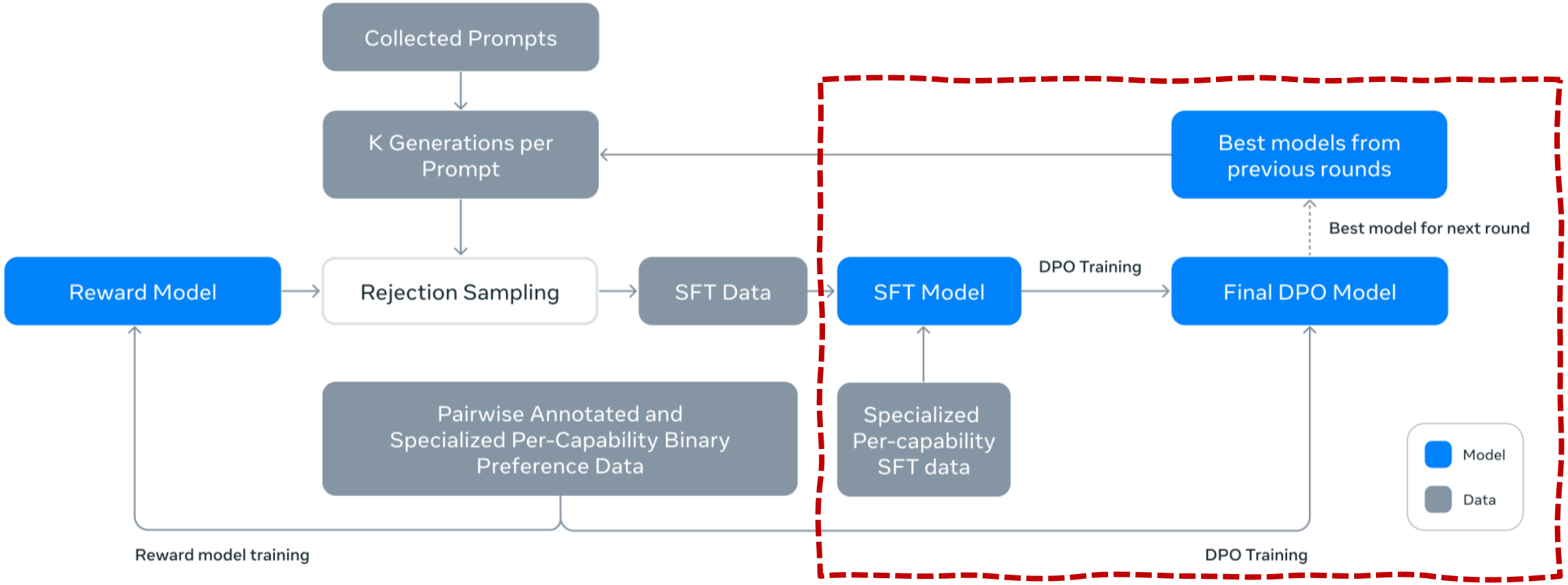
2、LLAMA3.1 后训练过程

2. **拒绝采样（Rejection Sampling）**：对输入 Prompt，模型生成若干个回答，RM 给予质量打分，选择得分最高保留作为 SFT 数据，其它抛掉；



2、LLAMA3.1 后训练过程

3. **DPO 训练：**人工标注数据给 DPO 模型调整 LLM 参数。DPO本质为二分类，从人工标注 <Prompt, Good Answer, Bad Answer> 三元数据里学习，调整模型参数并鼓励输出 Good Answer。



2、LLAMA3.1 后训练过程

- 上述过程会反复迭代，流程相同，区别 Rejection Sampling 阶段用来对给定 Prompt 产生回答 LLM 模型，从上一轮流程最后产生若干不同 DPO 模型，选择最好的那个在下一轮拒绝采样阶段给Prompt生成答案。随迭代增加 DPO 模型越来越好，拒绝采样能选出的答案质量越高，SFT 模型就越好，形成正反馈循环。

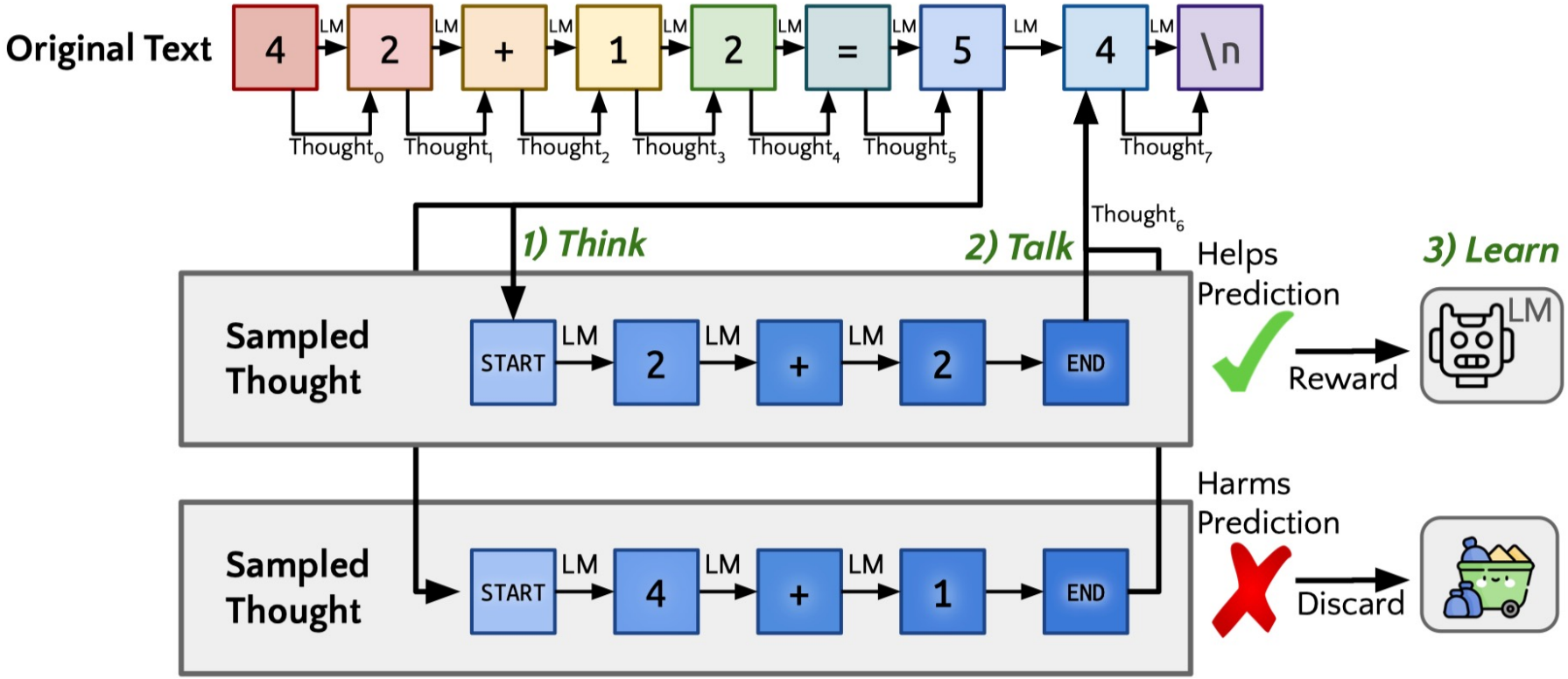
- **RM 在后训练作用区别：**RLHF 是把 RM 打分用在 PPO 强化学习阶段；Llama3.1 用 RM 筛选高质量 SFT 数据。
- **SFT 数据合成：**因为拒绝采样过程的回答由 LLM 产生，因此采用合成数据来训练 SFT 模型。

2、LLAMA3.1 提高特定下游任务性能

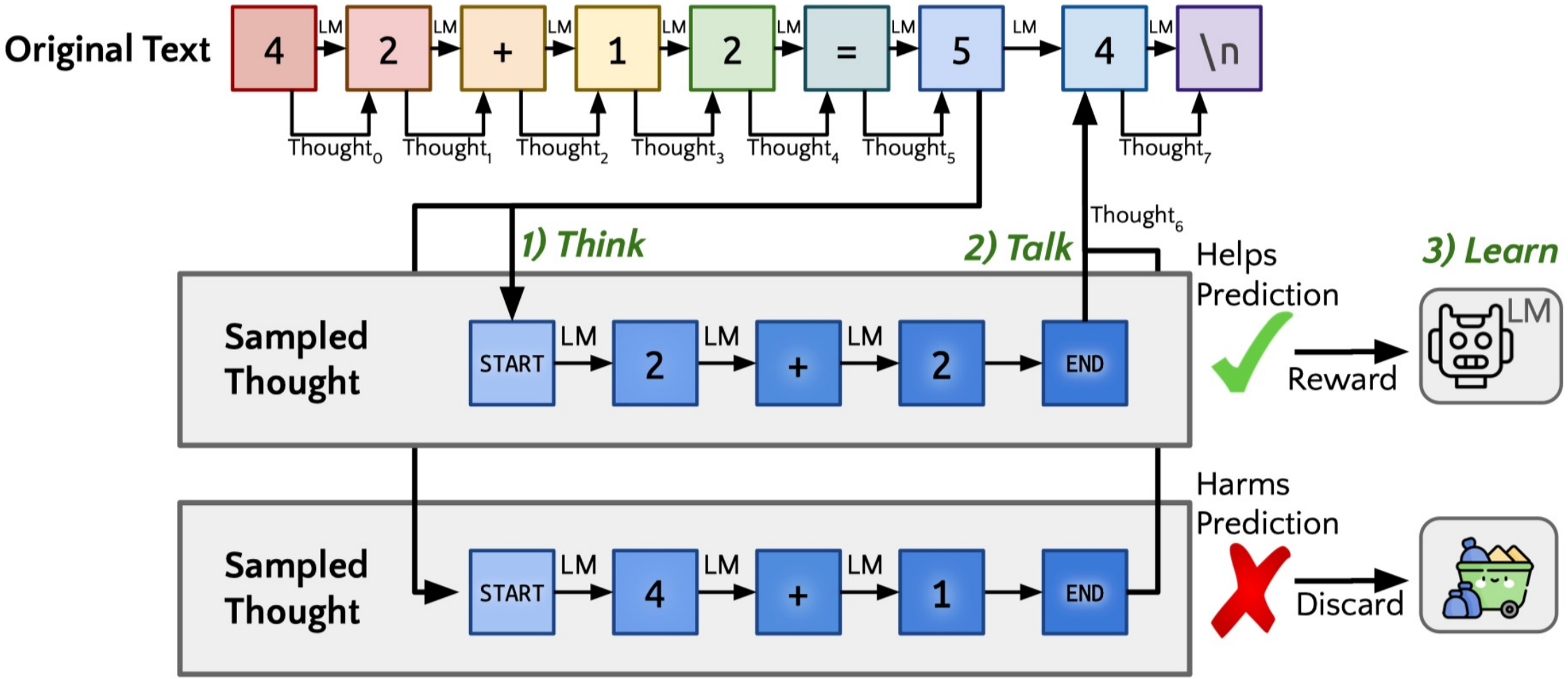
1. **DPO 原因：**采用 DPO 的 RLHF 而非更复杂 RL 强化学习算法， 因为后者稳定性不确定且制约AI 集群规模扩展 Scaling Law；
2. **提高模型编码能力：**采用训练代码专家、生成 SFT 合成数据、通过系统提示引导改进格式，以及创建质量过滤器（从训练数据中删除不良样本）等方法。
3. **Float8 量化推理：**将权重/输入量化为 fp8，然后乘以缩放因子 scale，fp8 x fp8 输出 bf16。使得推理速度更快，显存占用更少（推理在 H100 云资源集群）。

3、Quiet-STaR 强化学习新范式

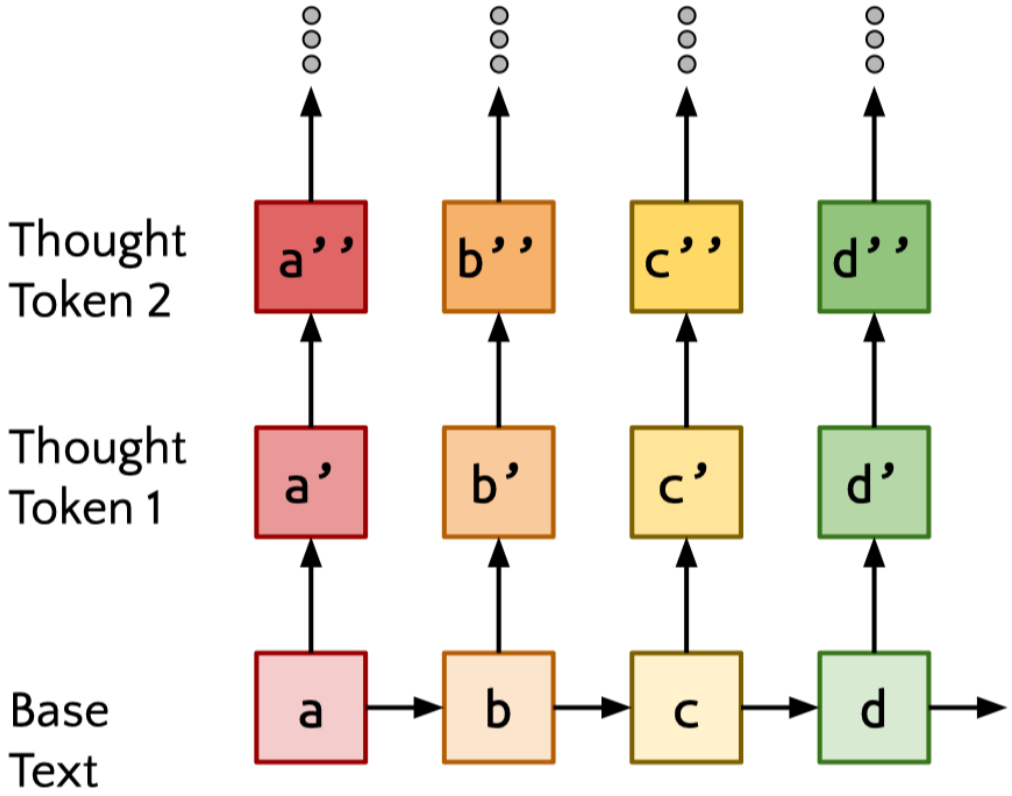
- LLM 刷榜依赖于特定任务微调。Quiet-STaR 采用全新范式：输入 token 后插入“思考”步骤，让打磨新内部推理。系统评估推理是否有助于预测后续文本，并相应地调整模型参数。



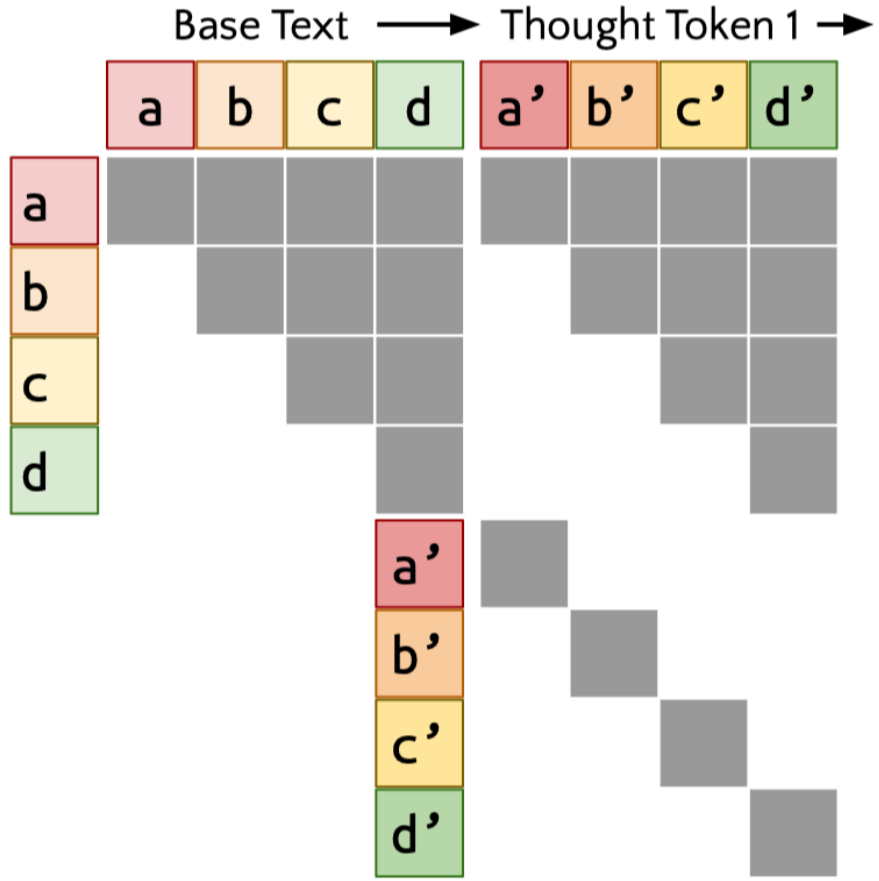
3、Quiet-STaR


Original Text
4
LM
2
LM
+
LM
1
LM
2
LM
=
LM
5
LM
4
LM
\n
Thought0
Thought1
Thought2
Thought3
Thought4
Thought5
Thought7
Thought6
1) Think
2) Talk
3) Learn
Sampled Thought
START
LM
2
LM
+
LM
2
END
Helps Prediction
Reward
LM
Sampled Thought
START
LM
4
LM
+
LM
1
END
Harms Prediction
Discard

3、Quiet-STaR：并行加速思考 thought 过程

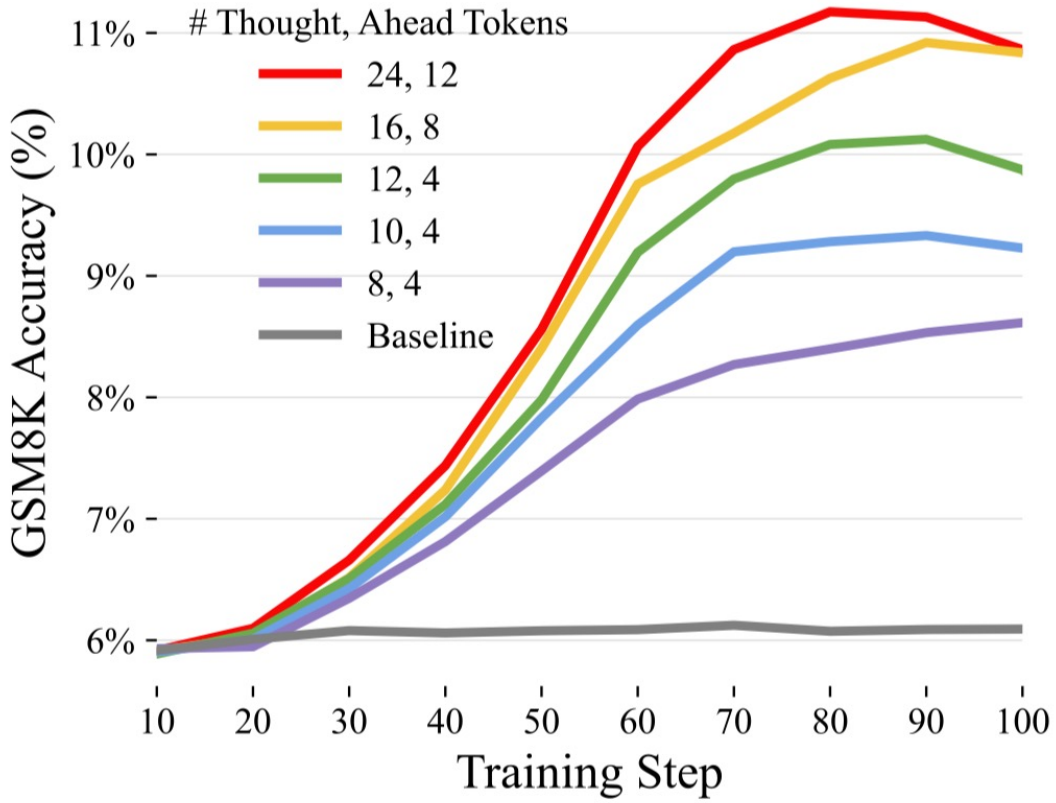


Generation Paths

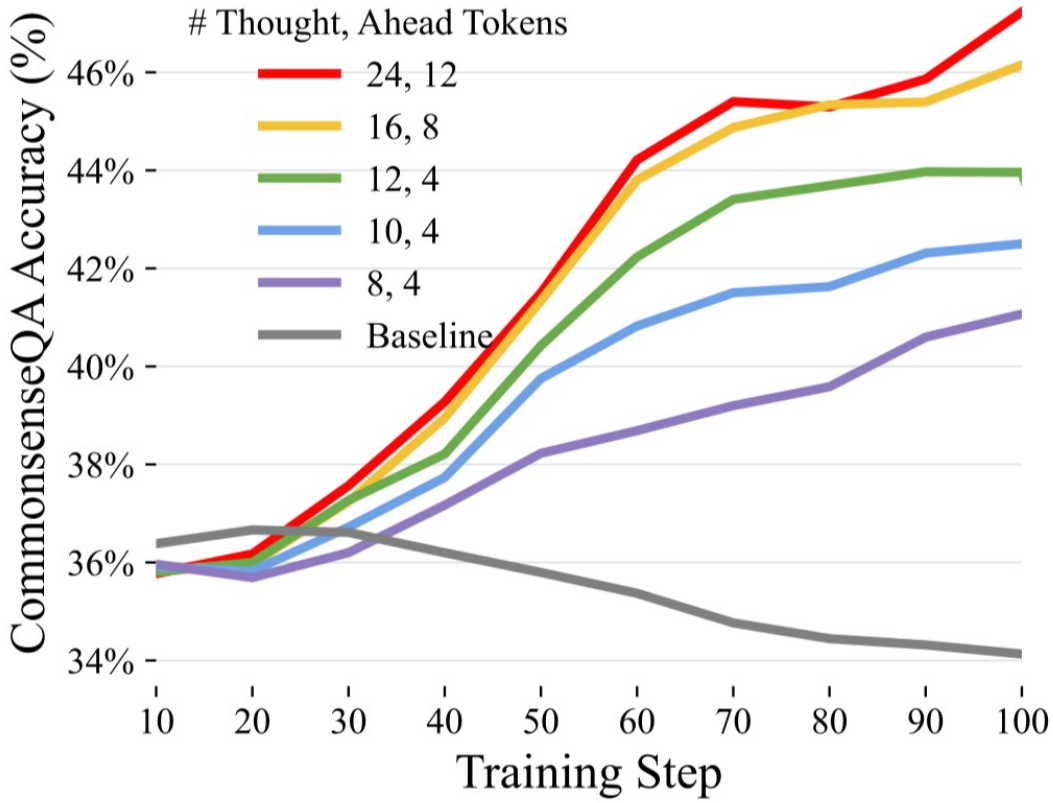


Parallel Inference Mask

3、Quiet-STaR：下游任务效果提升明显



(a) GSM8K



(b) CommonsenseQA

3、Quiet-STaR 与 CoT 结合

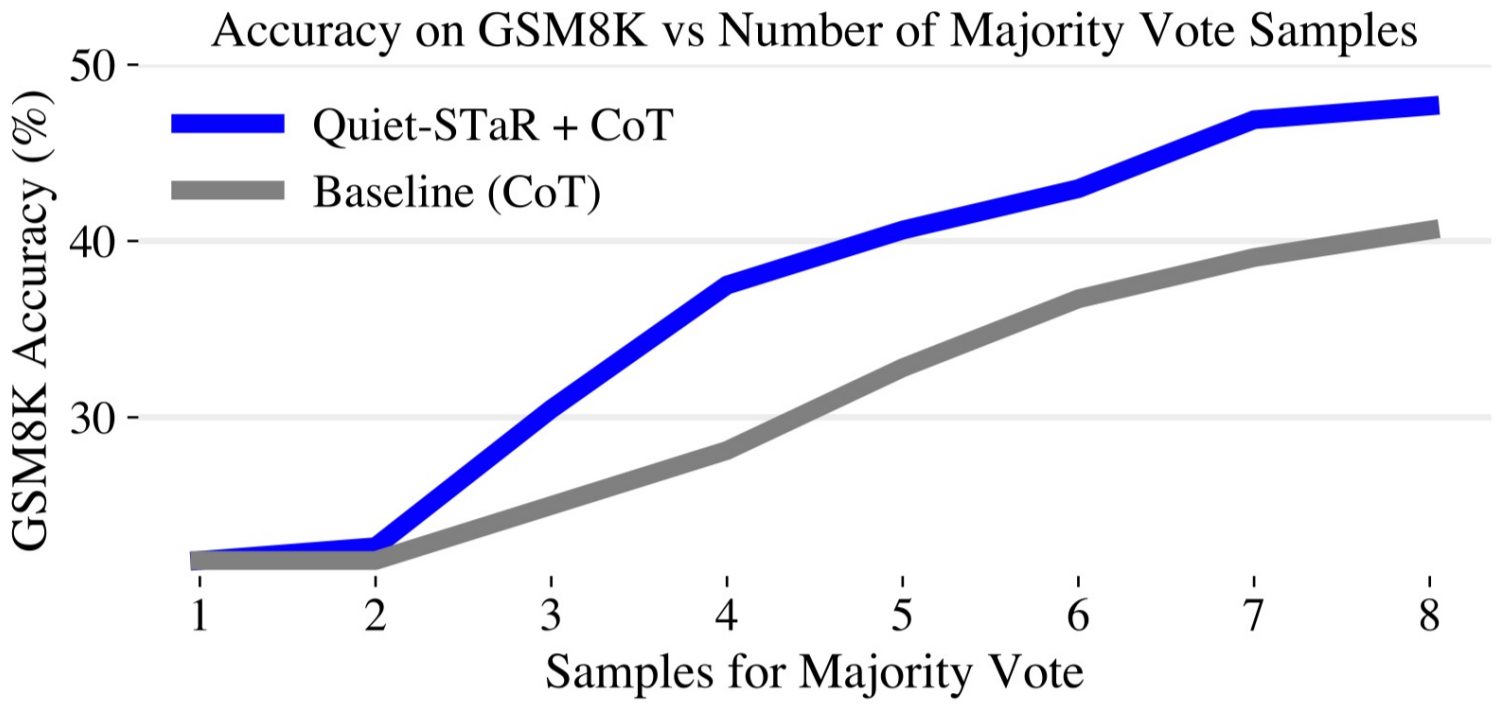
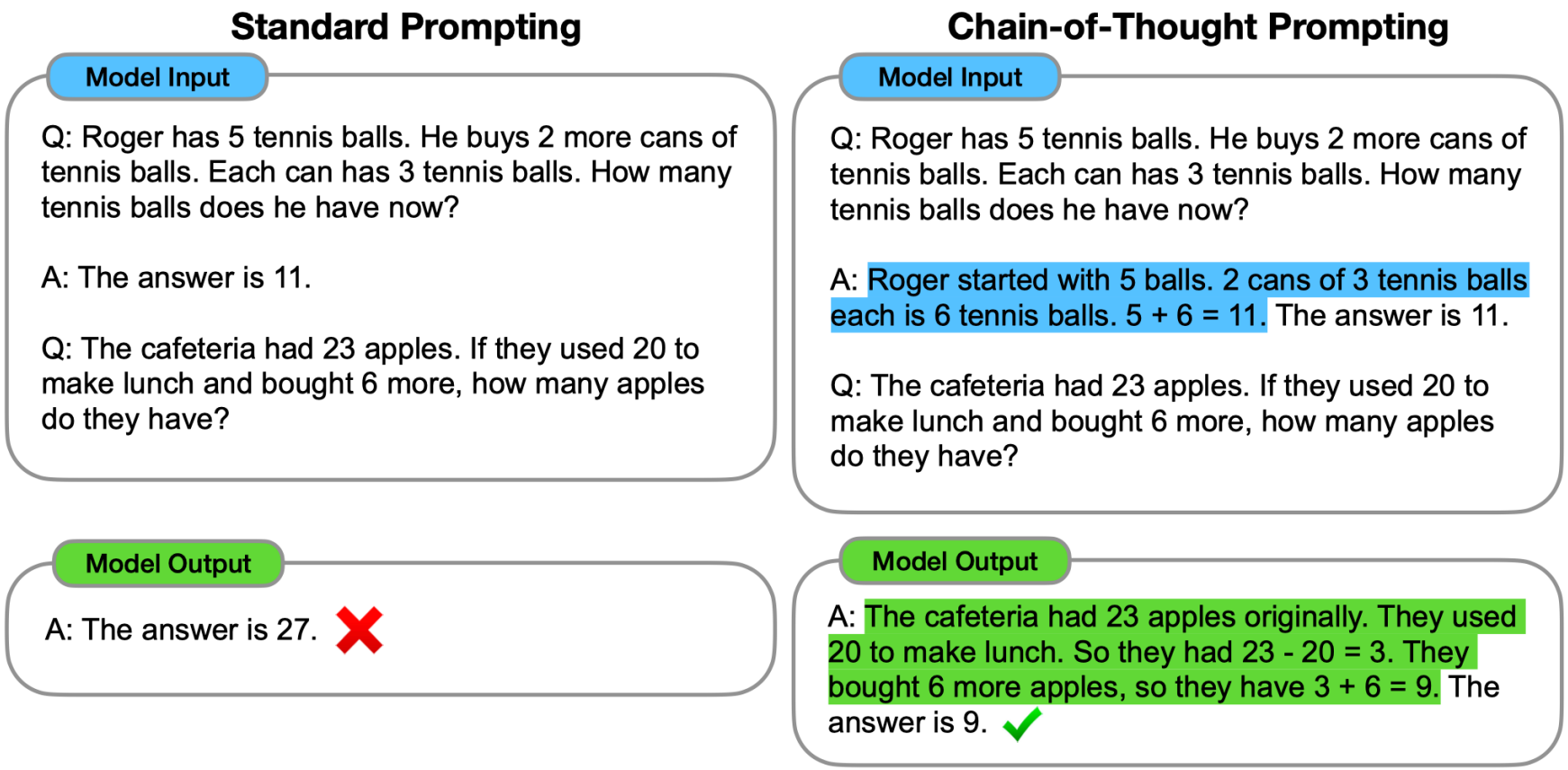


Figure 5: **Zero-shot performance on Quiet-STaR applied to chain-of-thought on GSM8K.** We visualize how using a Quiet-STaR trained Mistral model can improve chain-of-thought performance. We use an 8-thought-token-trained model and use its internal thoughts to improve the tokens in a zero-shot chain-of-thought (Kojima et al., 2022)

思维连 Chain-of-Thought

1. COT通过要求模型在输出最终答案之前，显式输出中间逐步的推理步骤这一方法来增强大模型的算数、常识和推理能力。



04

产业思考与洞察

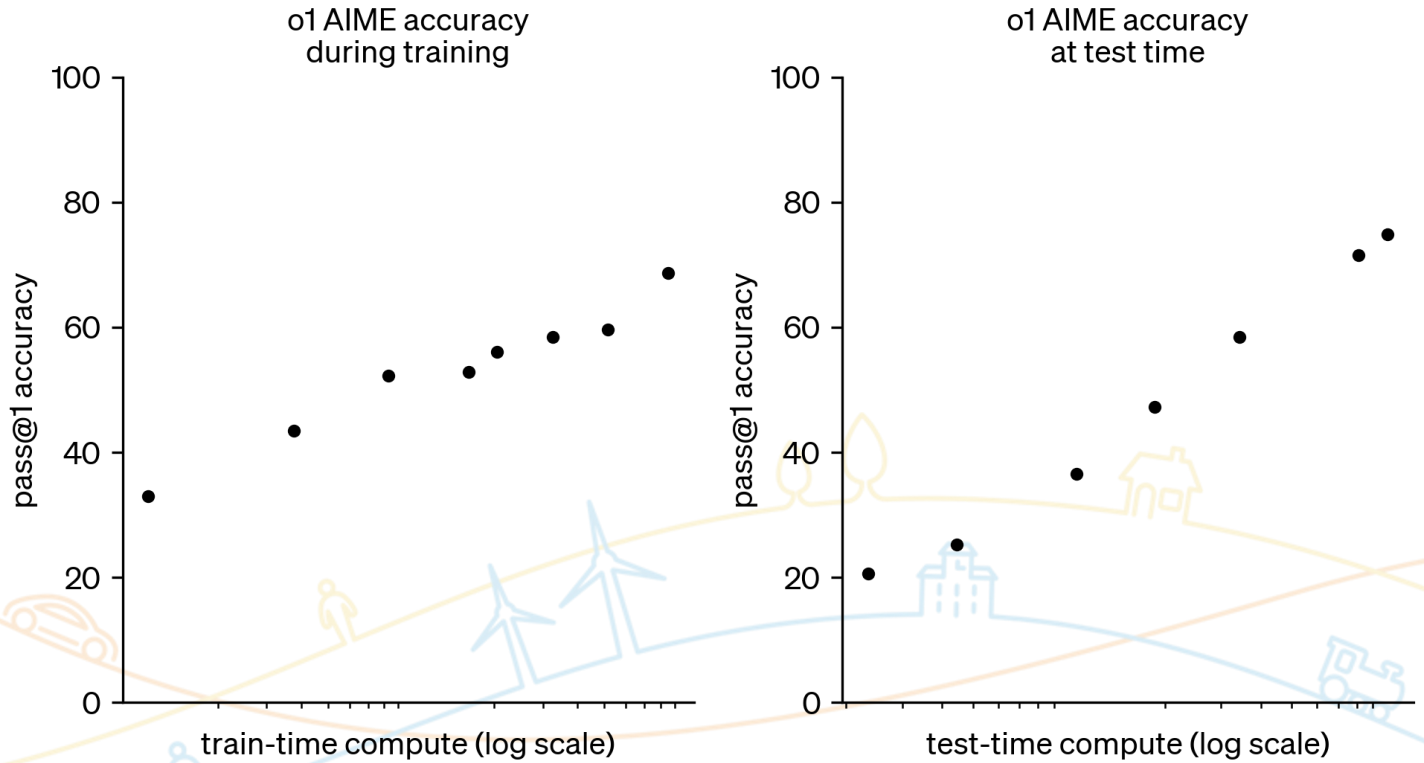
与 OpenAI 的差距

1. OpenAI 训练出 GPT4，全世界在挖 OpenAI 训练 LLM，希望追平 GPT4；
2. OpenAI 已在数据工程积累颇深发出 GPT-4o，全世界在思考如何做数据工程；
3. OpenAI 利用强化学习发明 o1 模型，全世界肯定开始挖掘 RL 算法潜力；

- OpenAI 永远在技术的制高点！

对算力的消耗的预测

1. Reinforcement Learning start Scaling Law !



算法技术路线的选择

1. 跟随派：Reinforcement Learning start Scaling Law ! MoE 都不重要!
2. 新路派：RL + CoT 不是 AGI 的未来！ mamba、 RKWV 结构才是未来!

Thank you

把AI系统带入每个开发者、每个家庭、每个组织，构建万物互联的智能世界

Bring AI System to every person, home and organization for a fully connected, intelligent world.

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ZOMI

Course chenzomi12.github.io

GitHub github.com/chenzomi12/AIFoundation