



# Solving the unsolvable:

o1 models and open models for  
breakthrough reasoning and  
GitHub Models Usage Demonstration

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# Acknowledgement To All Specialists on Inspiring Ideas

Engineering, Research-Based, and Practical Leads of AI



Business, Financial, Commercial-based, and Daily Users of AI



# Contents

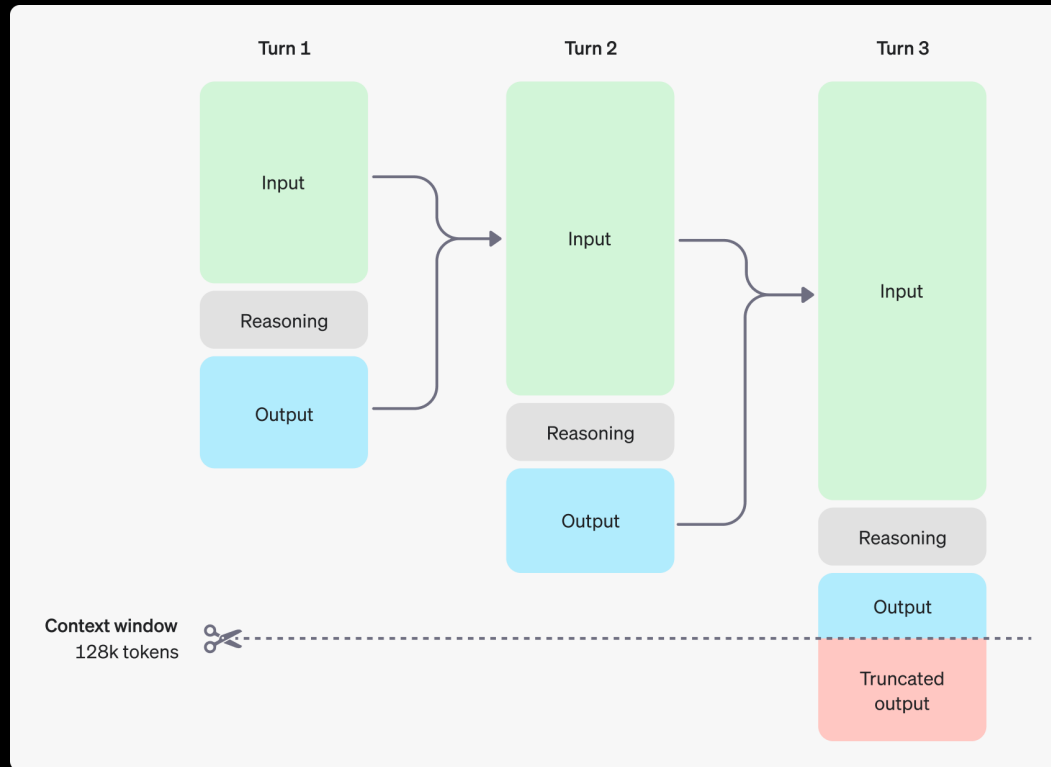
- Getting Into the Reasoning Models
- OpenAI o1, o-family, and its reasoning features
- OpenAI Forum: Learning to Reason with LLMs
- Other Competitive Reasoning LLMs
- Demo: Running Beneath GitHub Models
- Key Takeaways and **FOSSASIA** (how to dev local model based on sustainability)

# Getting Into Reasoning Models

Way making the LLMs smarter on generating answers

# Reasoning Models

Explore advanced reasoning and problem-solving models



*Reference: OpenAI*

- Reasoning models are new large language models trained with reinforcement learning to perform complex reasoning. Reasoning models think before they answer, producing a long internal chain of thought before responding to the user. Reasoning models excel in complex problem solving, coding, scientific reasoning, and multi-step planning for agentic workflows

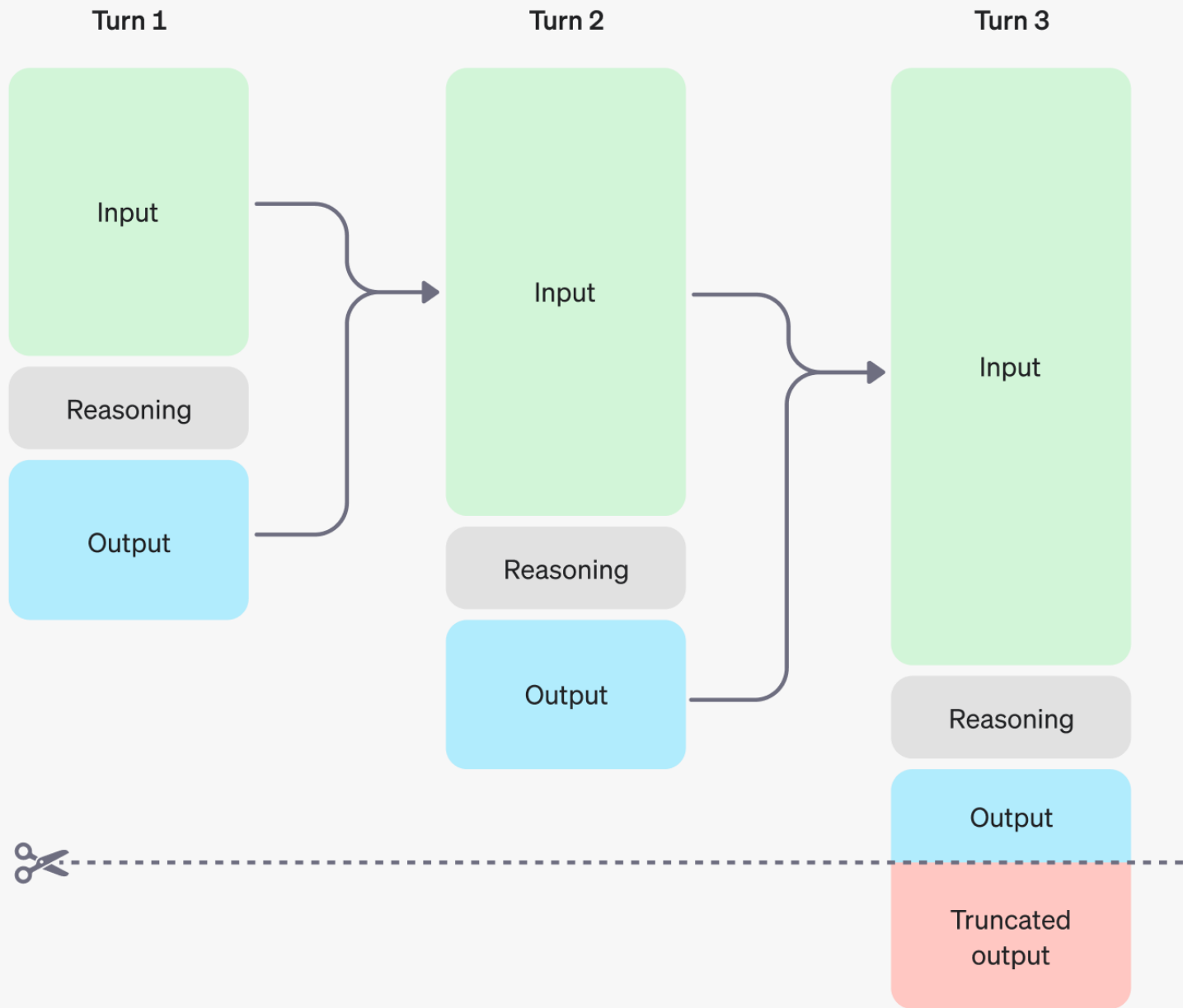
# How does it work?

Reasoning models introduce reasoning tokens in addition to input and output tokens. The models use these reasoning tokens to "think", breaking down their understanding of the prompt and considering multiple approaches to generating a response. After generating reasoning tokens, the model produces an answer as visible completion tokens, and discards the reasoning tokens from its context

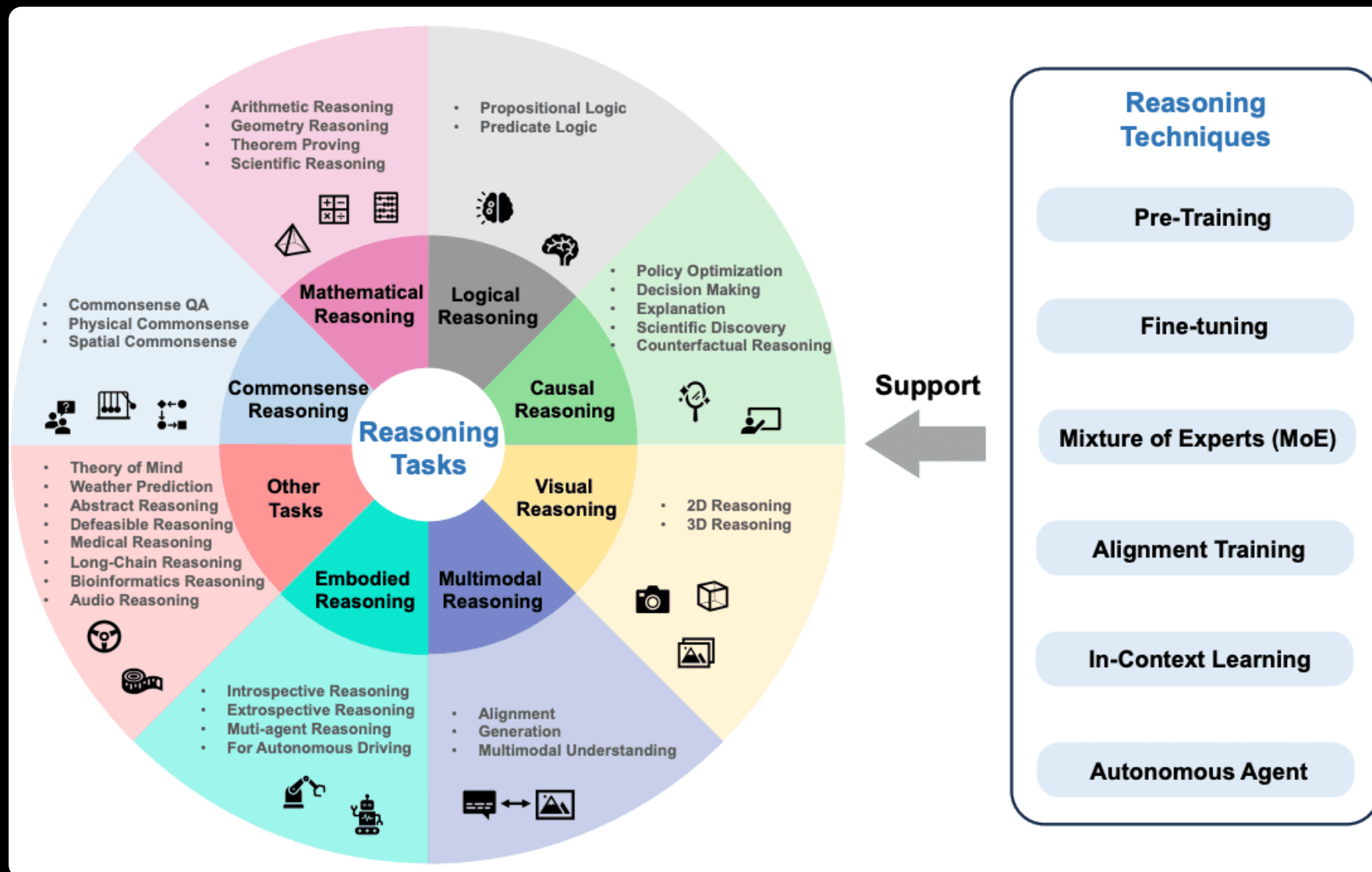


Chain-of-Thought (CoT)  
based Finetuning

Context window  
128k tokens



# Reasoning can be experts on any concepts.





# How It Differs From Normal LLMs?

## Large Language Models

- Best for Content Creation
- Simple Task Accuracy
- High Hallucination Rate

## Large Reasoning Models

- Best for Scientific Research
- Complex Task Accuracy
- Low Hallucination Rate



Please consider with the user of each task, along with the consideration of usage and pricing of the token from the model generation.

# OpenAI o1 and o1-mini

OpenAI's o-family, and its reasoning features

# OpenAI o1 series models



## o1-preview

The most capable model in the o1 series, offering enhanced reasoning abilities.

## o1-mini

**A faster and more cost-efficient option in the o1 series, ideal for coding tasks requiring speed and lower resource consumption.**

# What can OpenAI o1 do?



**Mathematical  
operations**



**Correlation  
detection**



**Deep  
analysis**

# Developer notes if you have used previous models

- Not a straight upgrade from GPT 4o! Use this tool for the right jobs.
- Current o1-preview status:
  - No system message
  - No parameters (like temperature, etc.)
  - No function calling
  - Modality is text-in, text-out
- Token limits: input 128K, output 32K (o1-preview) or 65K (o1-mini)
- It has more latency and uses more tokens than previous models.

# It has shone in the evals and safety leaderboards...

Dataset	Metric	gpt-4o	o1-preview
Competition Math AIME (2024)	cons@64	13.4	56.7
	pass@1	9.3	44.6
Competition Code CodeForces	Elo	808	1,258
	Percentile	11.0	62.0
GPQA Diamond	cons@64	56.1	78.3
	pass@1	50.6	73.3
Biology	cons@64	63.2	73.7
	pass@1	61.6	65.9
Chemistry	cons@64	43.0	60.2
	pass@1	40.2	59.9
Physics	cons@64	68.6	89.5
	pass@1	59.5	89.4
MATH	pass@1	60.3	85.5
MMLU	pass@1	88.0	92.3

Safety Metric	GPT-4o	o1-preview
% Safe completions on harmful prompts Standard	0.990	0.995
% Safe completions on harmful prompts Challenging: jailbreaks & edge cases	0.714	0.934
↳ Harassment (severe)	0.845	0.900
↳ Exploitative sexual content	0.483	0.949
↳ Sexual content involving minors	0.707	0.931
↳ Advice about non-violent wrongdoing	0.688	0.961
↳ Advice about violent wrongdoing	0.778	0.963
% Safe completions for top 200 with highest Moderation API scores per category in WildChat <a href="#">Zhao, et al. 2024</a>	0.945	0.971
StrongREJECT jailbreak eval <a href="#">Souly et al. 2024</a>	0.220	0.840
Human sourced jailbreak eval	0.770	0.960
% Compliance on internal benign edge cases “not over-refusal”	0.910	0.930
% Compliance on benign edge cases in XSTest <a href="#">Röttger, et al. 2023</a>	0.924	0.976

How does it do  
in the real problems?





## Here is a prompt:

Please plan a weekly schedule for all 3 of my kids for the summer of 2024 (July 8 – August 23). I would like them to be enrolled in camps most weeks. Please choose the same 2 weeks for family time where they won't be in camps. These 2 weeks don't have to be consecutive; just pick any two weeks for all 3 kids to be off at the same time. Here is information about each kid so you can choose the best camps for them.

- Tori is 16 (entering grade 12) and loves baking and dance.
- Fiona is 12 (entering grade 8) and enjoys reading, writing, and soccer.
- Gabe is 10 (entering grade 5) and loves martial arts, superheroes, and video games, especially Minecraft and Roblox.

They all love swimming. I'm open to exploring other classes they may enjoy, but please make sure they each have at least 2 classes involving these above activities they love. They should take a different class each week (no duplicates of the same class for the same kid).

**Your output** should be a **matrix of each week** of the summer by each kid, and what they are doing that week (either the title of the camp class they would enjoy, or a family time week where they are all off together).



### Master the Stage!

#### Acting Camp: Grades 5 & 6

If having fun is your favorite thing to do, then this camp is for you. Turn your creative side loose as you do script writing, improvisation, movement and creative dramatics. Don't worry if you have no experience, everyone is welcome. Complete your theater experience with your acting debut - an informal production for family and friends on the last day.

**CES 3700** **\$249**  
1 week MTWRF July 29 9 am-3 pm  
Sec. 939858 LA440 K. Glatz

#### Kids with Cameras: Grades 5 & 6

Whether you have been taking photos for a while, or are just picking up a digital camera for the first time - we want you! Open up a whole new world that screams "never bored." Start by learning photography basics. Then add some tricks and tips and get wild and creative. Fill your world with amazing new experiences as you go on photo shoots each day. Learn to use Photoshop Elements to improve your photo images. Bring a bag lunch and a digital camera to camp each day.

**CES 3669** **\$275**  
1 week MTWRF Aug 12 9 am-3 pm  
Sec. 939831 HS340 Staff



#### Become A Potter!: Grades 5 & 6

Pinch, coil, roll, slam and twist your way into making clay-art! Learn studio courtesy and safety, and how to mix and use different types of clay. Explore hand-building and firing methods and find out lots of ways to decorate and glaze your pieces. Enjoy a whole week to plan, make and finish your own ceramic treasure. **Note:** Due to firing and glazing, the majority of your projects will not be available until two - three weeks after camp; you will receive an email when they are ready.

**CES 3633** **\$275**  
1 week MTWRF July 8 9 am-3 pm  
Sec. 939855 F410 Staff

1 week MTWRF July 15 9 am-3 pm  
Sec. 939836 F410 Staff

#### Chess - Get Your Game On: Grades 5 & 6

Get your chess game together as you learn to open, trap, strategize and do tactical maneuvers that will leave your opponents in the dust. Get amped up and take part in awesome competitions, tournaments and contests that will showcase your game. Go the chess distance!

**CES 7336** **\$249**  
1 week MTWRF July 15 9 am-3 pm  
Sec. 939811 LA420 B. Wilson

1 week MTWRF July 22 9 am-3 pm  
Sec. 939866 LA420 B. Wilson

#### Kids Court: Grades 5 & 6

Discover the basics of the legal system, such as the roles of judges, lawyers, witnesses, and jurors. Learn how to research, prepare, and present a mock trial case with your teammates. Practice your public speaking, critical thinking, and teamwork skills in a supportive and friendly environment. Whether you want to be a lawyer, a judge, or just have fun with your friends, the Kids Court Camp will give you an unforgettable experience!

**CES 7443** **\$249**  
1 week MTWRF July 29 9 am-3 pm  
Sec. 939872 LA100 E. Tamulewicz

GRADES 5 & 6

# Of note!!

- Camps are one single week
- Camps are limited to certain grades
- There is a lot going on with this formatting

### Reference:

[https://www.schoolcraft.edu/ppl/wp-content/uploads/sites/4/2024/01/20231120\\_PPL\\_Kids\\_On\\_Campus\\_Schedule\\_Summer\\_2024\\_05.pdf](https://www.schoolcraft.edu/ppl/wp-content/uploads/sites/4/2024/01/20231120_PPL_Kids_On_Campus_Schedule_Summer_2024_05.pdf)

Register your child for the grade level they will be entering in the fall.

# Key Takeaway:

Big strength of o1 model is keeping track of a large quantity of details and keeping up with the nuance.



# More Examples (where details matter)

## Codebase Changes

Using the provided documentation below, summarize the key changes between API versions. Then craft a blog post announcing the changes for audience of software developers.

## Agentic Workflows

You are driving a Minecraft character. Your goal is to obtain a diamond sword. Assume that you just started the game, and the only thing in your inventory is a crafting table.

You have the following tools at your disposal:

+ wander(target) – walk around until you find the specified target. The target can be a mob or an entity like a type of tree.

+ punch(target) – hit the target with your bare hands. The target can be a mob or an entity like a type of tree.

...

Build a plan using the tools to get a diamond sword.

## Productivity

Check the University of Michigan football schedule against my calendar and let me know if there are any conflicts.

# University of Michigan football schedule:

*<insert>*

-----

# My calendar in ics format:

*<insert long text version of ics file here>*

# Execution with GPT-4o

I used the same user prompt, a system prompt of “You are a helpful assistant.”, and `max_tokens = 3000`.

- This model call ran in about 10 seconds, much less than the minute for o1-preview.
- Lots of bugs where the model is failing to keep track of details properly. Kids were placed in classes which weren't offered for their grade. Kids were placed in classes that weren't offered that week.

## Examples

Tori was placed in both “Curtain Call: Honing Your Acting Skills” and “Baker’s Academy” classes which are only offered for grades 7-9, and she is in 12th grade.

Tori was placed in “Welding Techniques & Unique Art” on the week of August 12, and it is only offered the week of August 5. Same with “Fashion Design & Illustration” (offered on July 8, and scheduled by model for July 15).

Fiona was placed in “Become a Potter” which is only for grades 5-6 and she is in grade 8.

I stopped looking at this point, so this list may not be exhaustive.

# Execution with OpenAI o1

- I copy/pasted a long chunk of pages 9-20 into the prompt. (So, **the input was text-only**, not image of that brochure page.)
- This took about one minute to run.
- I purposefully asked for it to go until August 23 when the camp's offerings end on August 16, the week before, to see what it would do.

Sure, here's a weekly schedule for your kids for the summer of 2024, from July 8 to August 23. The schedule includes camps that align with their interests and ensures they each have at least two classes involving their favorite activities. The two weeks chosen for family time are August 12-16 (Week 6) and August 19-23 (Week 7), where all three kids are off together.

**Weekly Schedule Matrix:**

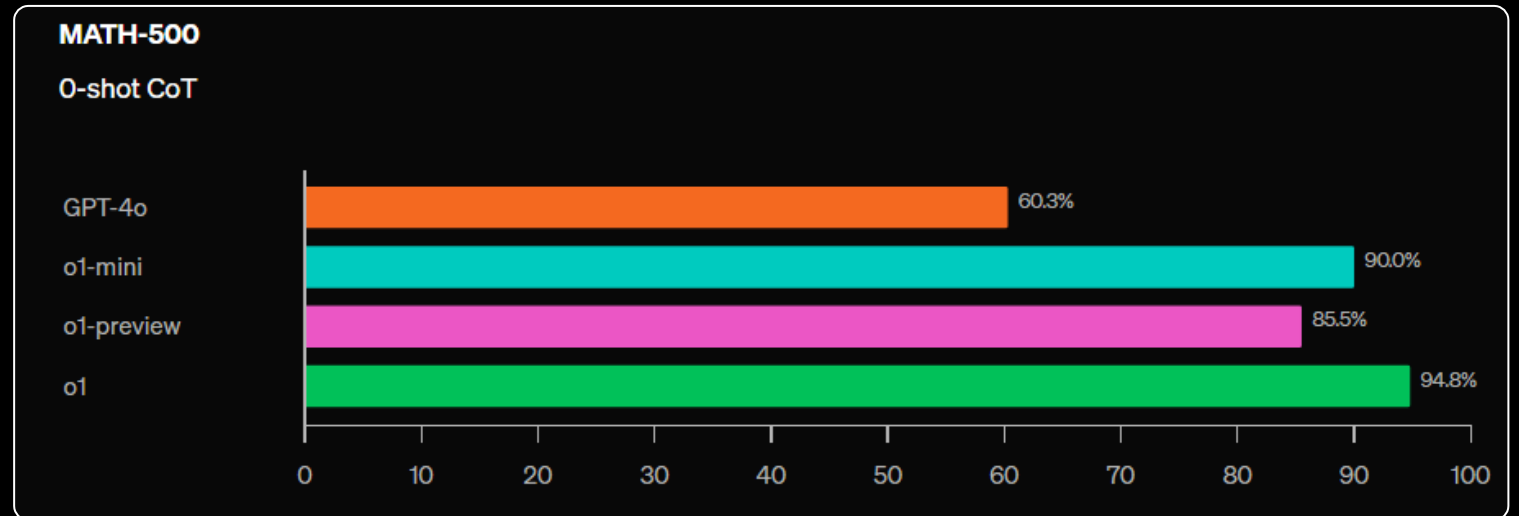
Week	Tori (Age 16, Grade 12)	Fiona (Age 12, Grade 8)	Gabe (Age 10, Grade 5)
Week 1 July 8-12	Fashion Design & Illustration	- Off -	Minecraft Modders
Week 2 July 15-19	- Off -	Anime & Manga Drawing	Roblox eSport Game Design
Week 3 July 22-26	Bakers Workshop	Teen Writers Inc.	Rev Up a Robot
Week 4 July 29-Aug 2	Ceramic Arts	The Art Café	Pokémon® Masters: Designers & 3D Makers Unite
Week 5 Aug 5-9	Welding Techniques & Unique Art	Make It Work! Structure & Design	Zombie Apocalypse Survival Training
Week 6 Aug 12-16	<b>Family Time</b>	<b>Family Time</b>	<b>Family Time</b>
Week 7 Aug 19-23	<b>Family Time</b>	<b>Family Time</b>	<b>Family Time</b>

# This functionality lends itself to other scenarios as well

Math

Puzzles

Coding



## Take Note!

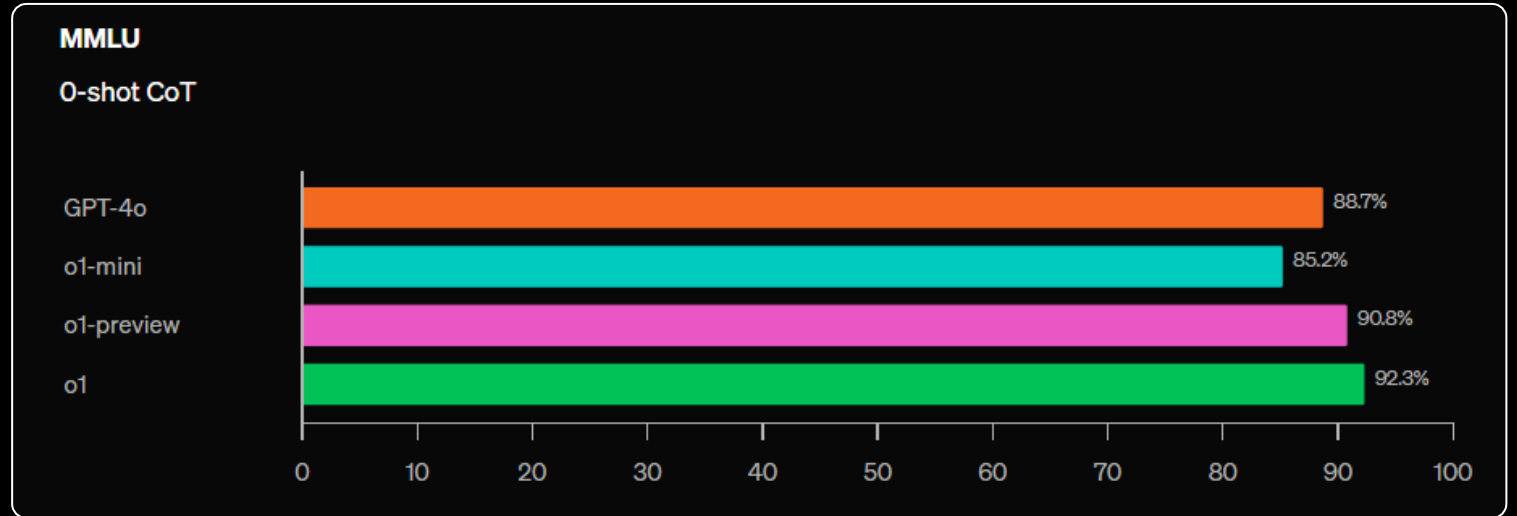
When you don't need it to keep track of nuanced level of detail, GPT-4o can be comparable in quality, and it is currently much faster and less expensive to call.

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## Take Note!

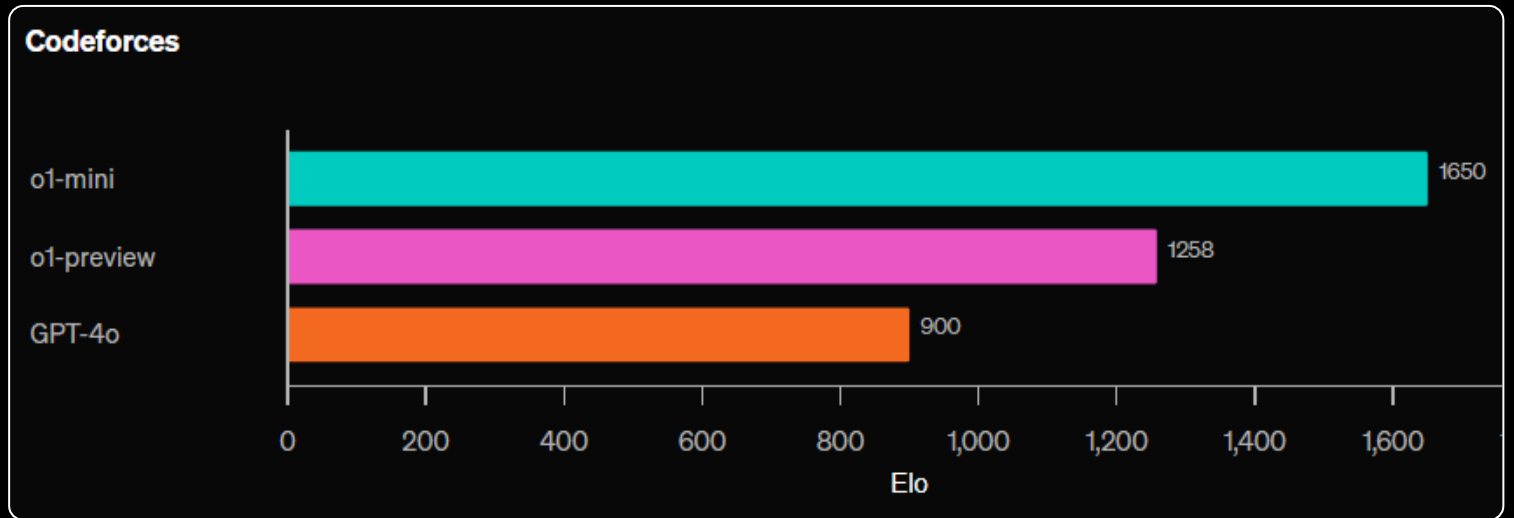
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Puzzles

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## Take Note!

When you don't need it to keep track of nuanced level of detail, GPT-4o can be comparable in quality, and it is currently much faster and less expensive to call.



# Azure AI Foundry



Copilot Studio



Visual Studio



GitHub



Azure AI Foundry SDK



## Model Catalog

Foundational models

Open-source models

Task models

Industry models



Azure OpenAI Service



Azure AI Search



Azure AI Agent Service



Azure AI Content Safety



Azure Machine Learning

Evaluations

Customization

Governance

Monitoring

## Observability

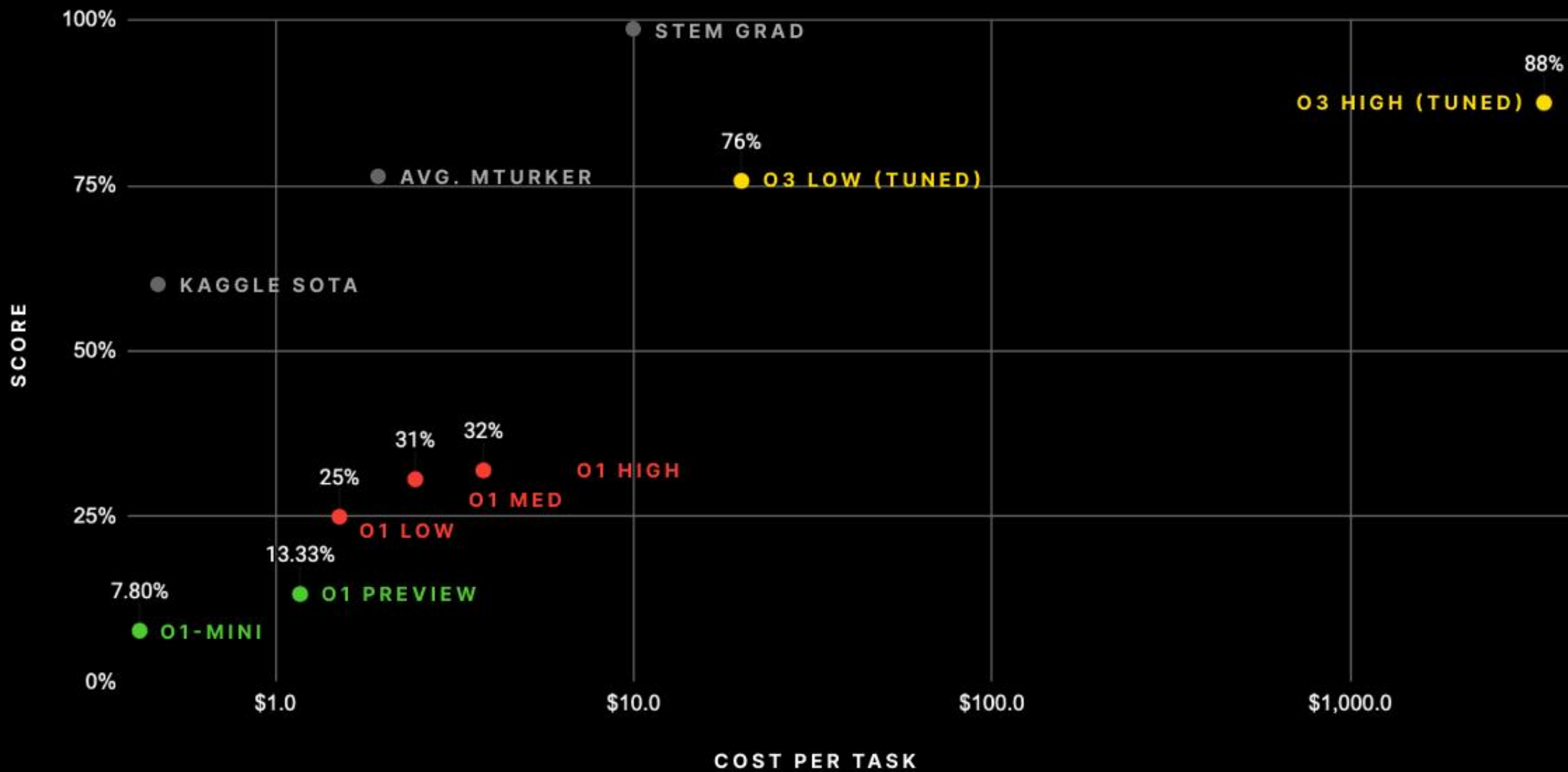
# OpenAI o3 mini:

## Future Reasoning Model Development to Artificial General Intelligence (AGI)

Reinforcement learning was used to teach o3 to "think" before generating answers, using what OpenAI refers to as a "private chain of thought". This approach enables the model to plan ahead and reason through tasks, performing a series of intermediate reasoning steps to assist in solving the problem, at the cost of additional computing power and increased latency of responses

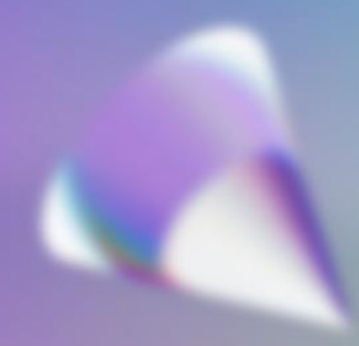
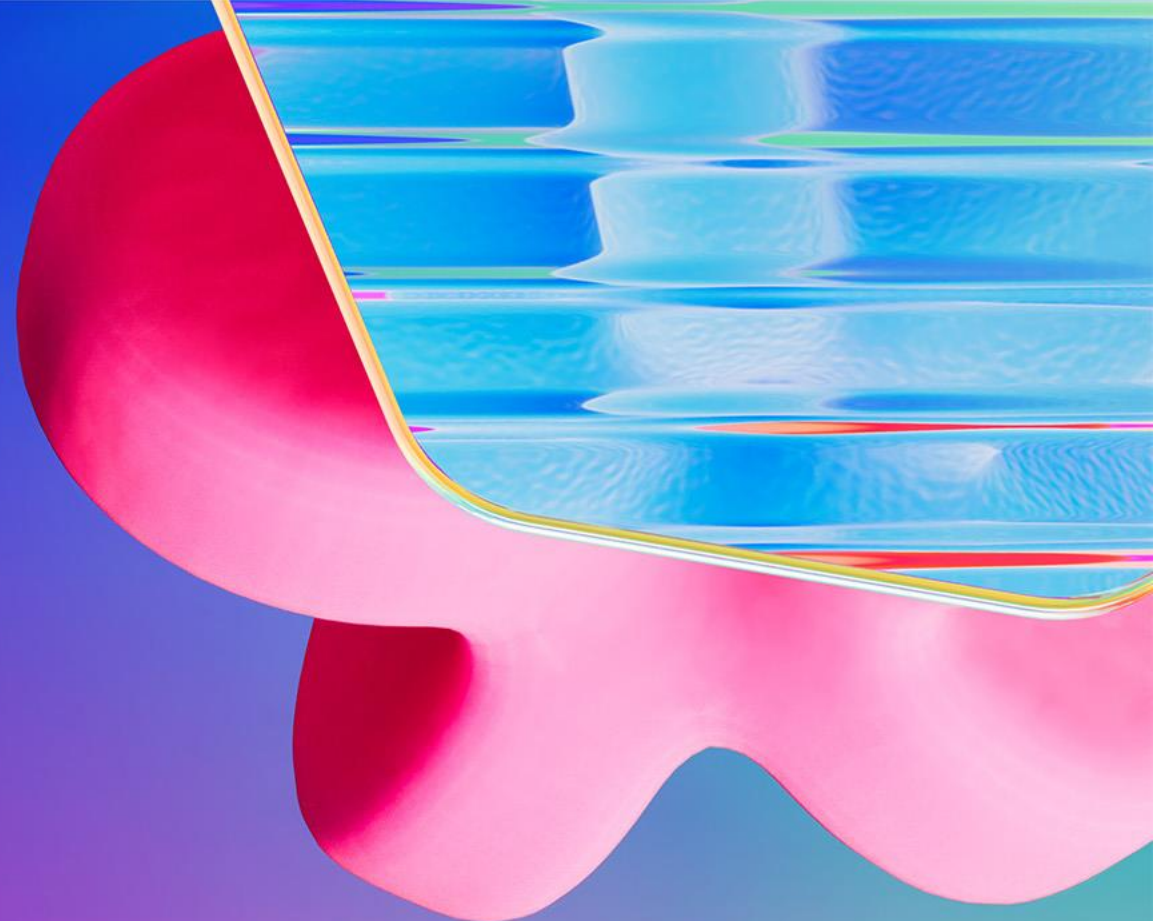


O SERIES PERFORMANCE / ARC-AGI SEMI-PRIVATE EVAL



# Demo:

Comparing GPT-4o, o1-Preview, o3-mini-Preview



# OpenAI Forum: Learning to Reason with LLMs



- Home
- Events
- Content
- People
- Groups
- Discussion
- Messages
- Channels
- Communities
- Help



### Online Members



See More

### Events



Starting in 6 days



**AI Economics in the OpenAI Forum**



**Ronnie Chatterji**  
Chief Economist  
OpenAI



**Kevin Weil**  
Chief Product Officer  
OpenAI

Live in 20 days



**Paris AI Startup Illuminates History and Culture**

Ask Mona Re-Imagines Access to Knowledge



**Marion Carré**  
CEO and Co-Founder  
Ask Mona



**Valentine Schmite**  
Co-Founder and Managing Director, Ask Mona



**Martin Signoux**  
AI Policy Lead, Europe  
OpenAI

Starting in 27 days



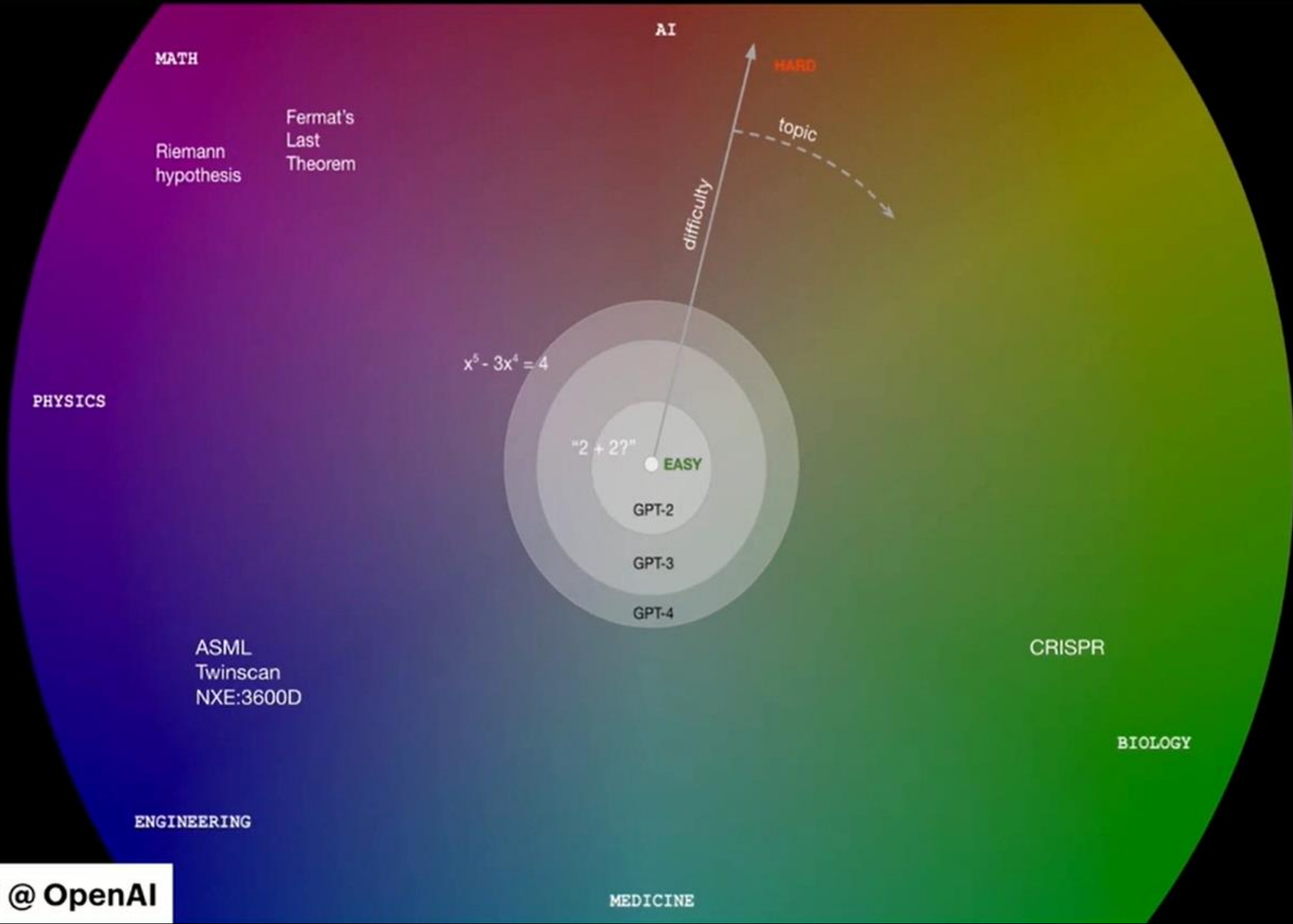
**From Experiment to Institution-Wide: How AI is Changing European Higher Education**

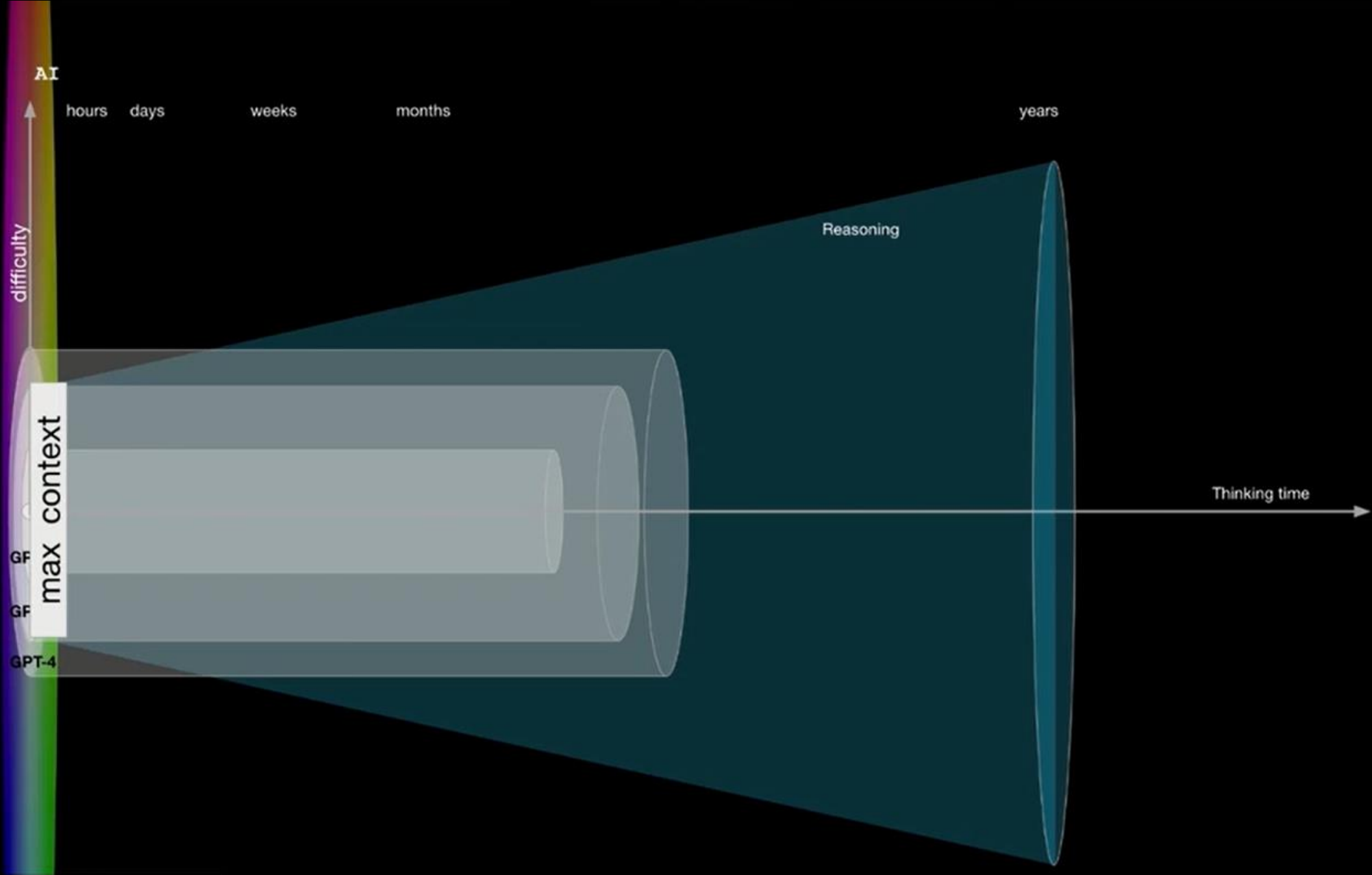


**Louis-David Benyayer**  
Associate Professor  
ESCP Business School



**Jayna Devani**  
Higher Education Lead, EMEA  
OpenAI







- “Think step by step” is still SoTA for reasoning since 2021...
- Unfortunately we don't have robust **real** Chain of Thought

#### Problem

Tom has a red marble, a green marble, a blue marble, and three identical yellow marbles. How many different groups of two marbles can Tom choose?

#### Solution

There are two cases here: either Tom chooses two yellow marbles (1 result), or he chooses two marbles of different colors  $\binom{4}{2} = 6$  results. The total number of distinct pairs of marbles Tom can choose is  $1 + 6 = 7$

#### Answer

7

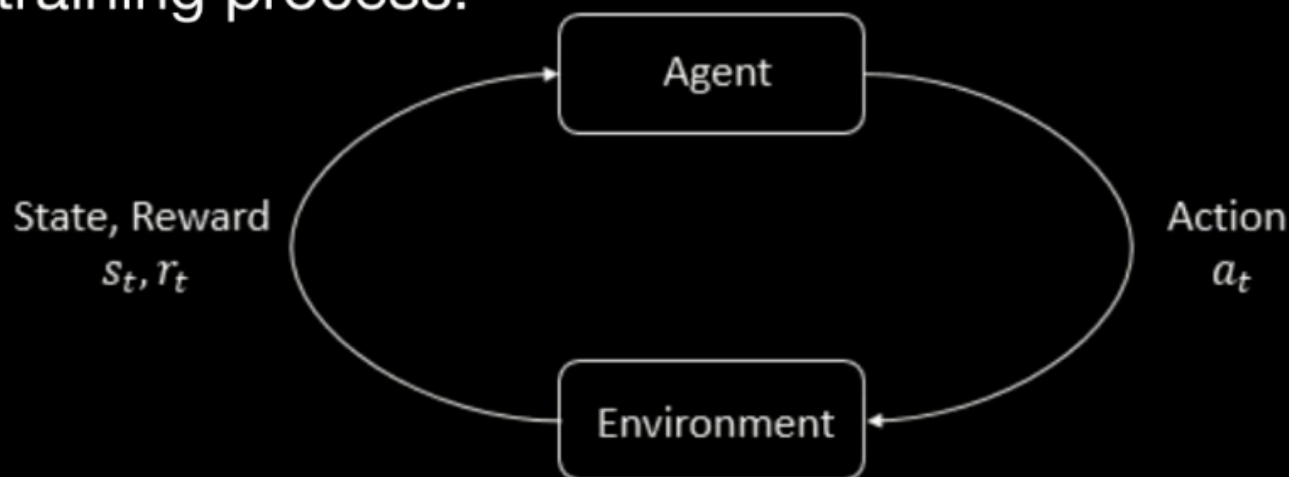
We want the model to develop  
its own way of reasoning → RL

#### Thought process:

1. Start: Problem seems simple: create groups of two marbles from a given set. Initial approach: each marble can be paired with every other. Straightforward calculation would be total combinations:  $(7 \text{ choose } 2)$ .
2. Realization: Wait, identical yellow marbles will form same pairs. The calculated combinations would include identical pairs. Need to consider distinct pairs only.
3. Approach 1: Try focusing on the yellow marbles. Three yellow marbles could form 3 pairs. But they are identical, so they form just one unique pair.
4. Approach 2: Now consider the rest of the marbles. There are four distinct ones. Try pairing them. Can use the formula for combinations  $(4 \text{ choose } 2)$  for these. This should account for all possible distinct pairs of different colors.
5. Confirmation: Compare these results to the solution. It makes sense. 1 pair of identical yellow marbles and 6 pairs of distinct colored marbles. So 7 distinct pairs.
6. Insight: It's not just about combinations. Identical items complicate things. It's a crucial consideration in combinatorics. Learned for future problems.
7. Confidence: Managed to arrive at the correct solution. Proud of having navigated this complex aspect.

## Reinforcement Learning

- OpenAI o1 is trained via a large-scale reinforcement learning algorithm that teaches the model how to think productively using its chain of thought in a highly data-efficient training process.

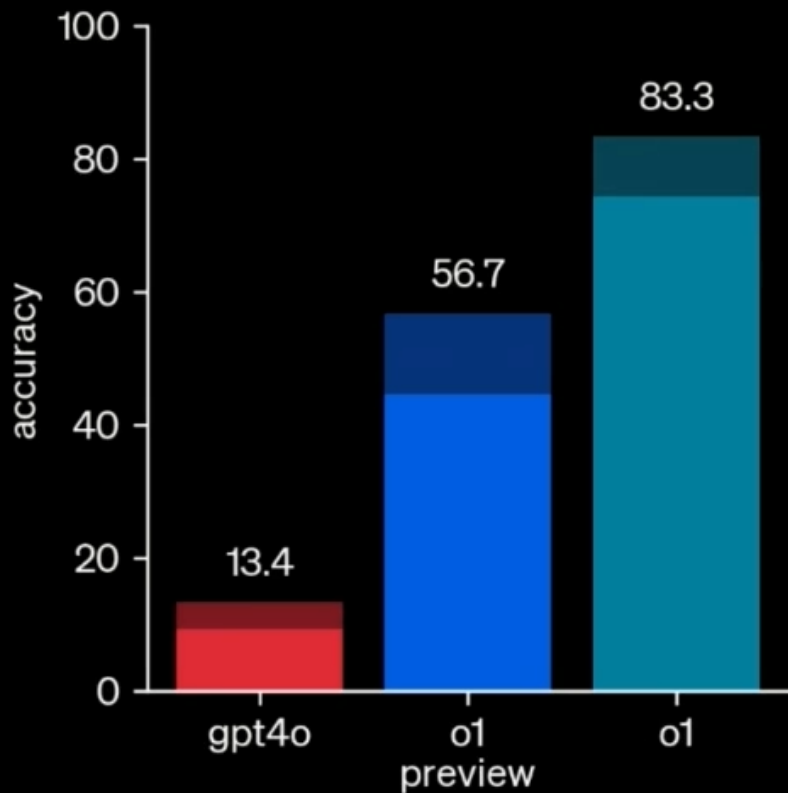


- CoT is longer and higher-quality than via prompting
- Many emergent behaviors like
  - error correction
  - trying multiple strategies
  - breaking down problems into smaller steps

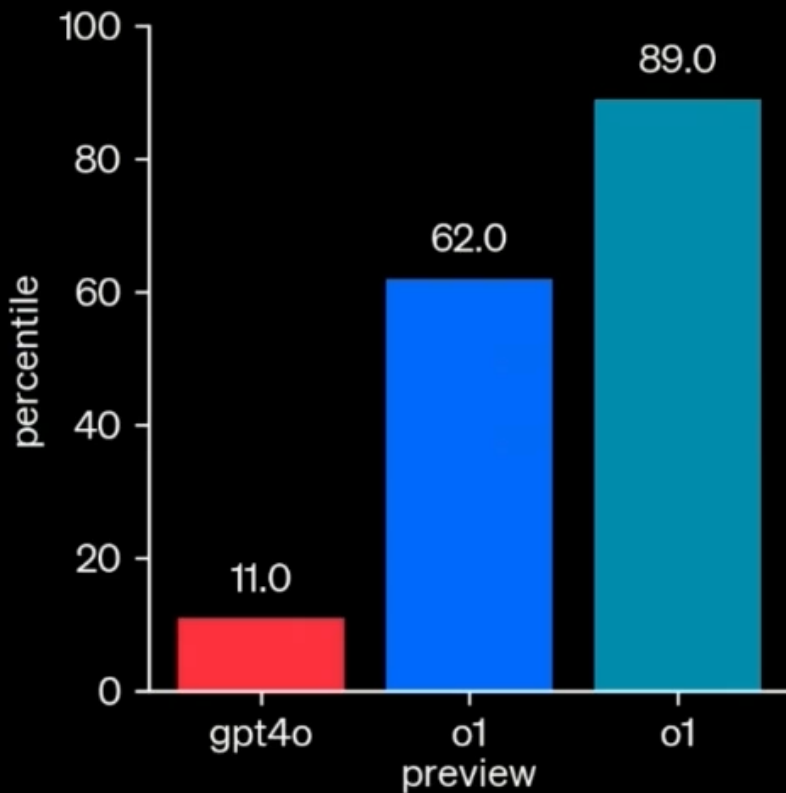
Let's look at some of these CoT!

# Reasoning Benchmarks

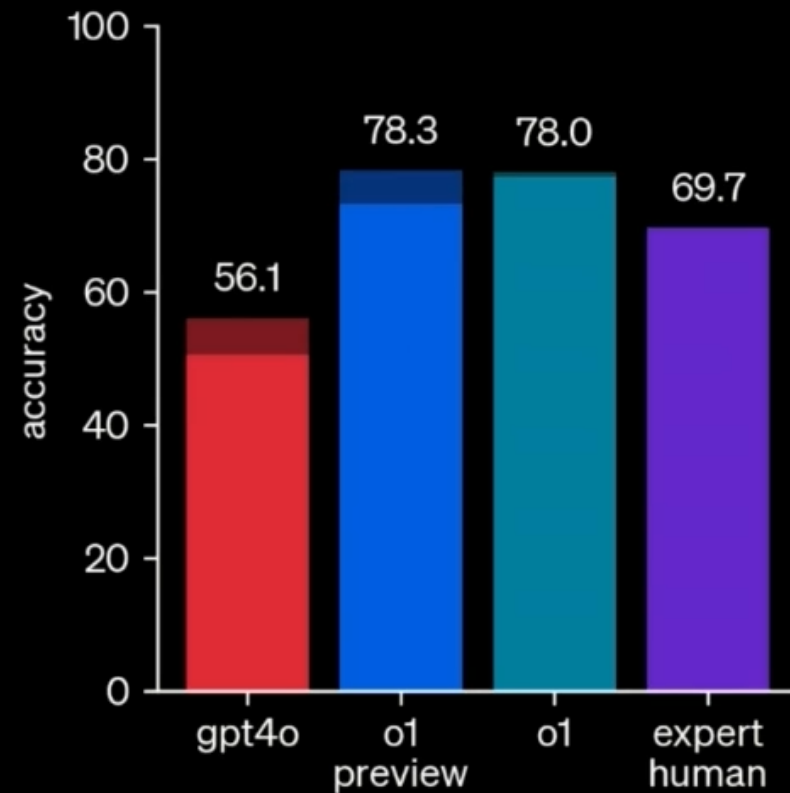
Competition Math  
(AIME 2024)



Competition Code  
(Codeforces)



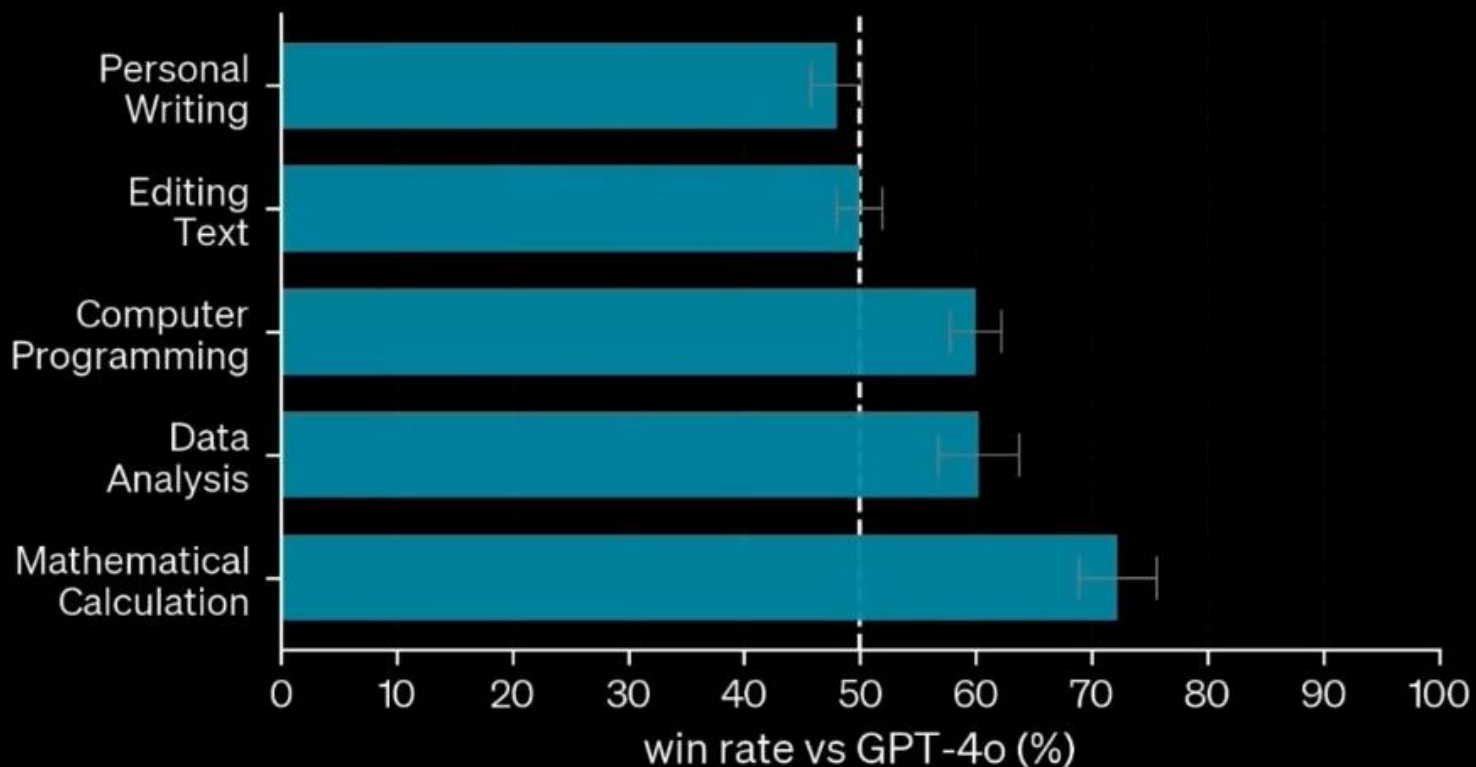
PhD-Level Science Questions  
(GPQA Diamond)



# Human Preferences Evaluation

- o1 isn't better at everything, some tasks don't benefit from too much reasoning

Human preferences by domain: o1-preview vs GPT-4o





## Thinking about OpenAI o1 family of models

- This is only the beginning. We've only just scratched the surface of this new paradigm.
- We will focus on iteratively releasing new models that will be not only smarter, but include new model capabilities.

*Instruction following*

*structured outputs*

*safety*

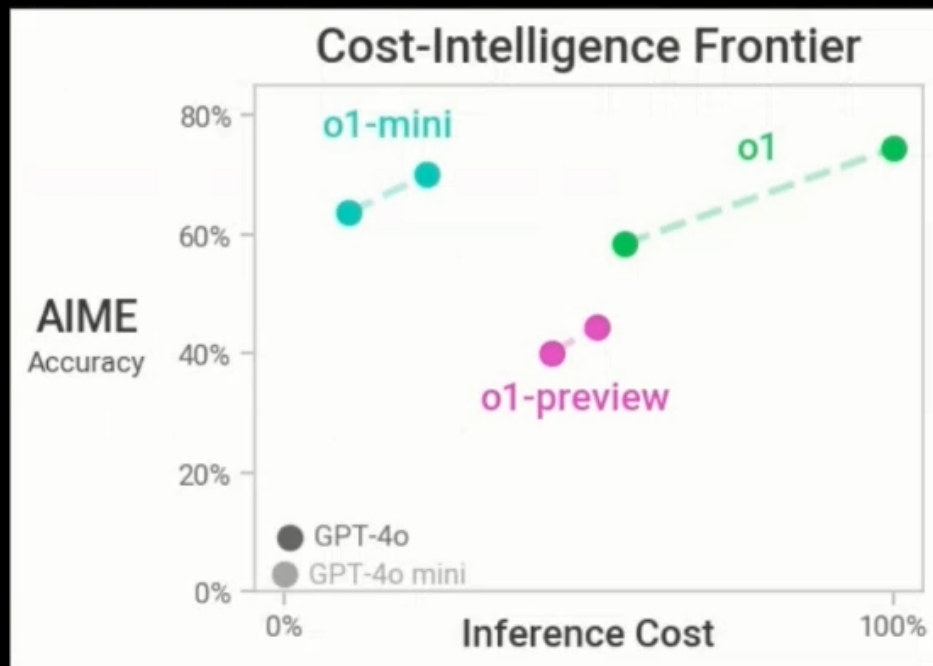
*code interpreter*

*browsing*

## What is o1-mini?

OpenAI o1-mini is a model in the o1 series that

- Thinks before answering the question
- Small & fast & cheap (80% cheaper than o1-preview)
- Optimized for reasoning tasks





# Is it safe?

Metric	GPT-4o	o1-mini
% Safe completions refusal on harmful prompts (standard)	0.99	0.99
% Safe completions on harmful prompts (Challenging: jailbreaks & edge cases)	0.714	0.932
% Compliance on benign edge cases ("not over-refusal")	0.91	0.923
Goodness@0.1 StrongREJECT jailbreak eval (Souly et al. 2024)	0.22	0.83
Human sourced jailbreak eval	0.77	0.95





## How do we optimize for reasoning tasks?

LLMs are often pretrained on vast text datasets.

- Good world knowledge
- Can be expensive & slow

For o1-mini:

- We prioritize STEM reasoning data in pretraining.
- We take the same high-compute reinforcement learning process.



## Ongoing work

We will frequently update & add new features to o1-mini.

- Instruction following
- Function calling
- Developer messages
- Structured outputs
- Multimodal
- World knowledge
- And more...

# Other Competitive Reasoning LLMs

Selecting Other Models To Be More Reasoning and Lower Price?

# Small Reasoning Models



Cost  
Effectiveness



Deployment  
Flexibility



Ultra-low  
Latency



Easier to  
Customize

# Use Cases of Small Reasoning Models



Latency bound scenarios where fast response times are critical



Cost constrained tasks and use cases



Resource constrained environments



Select tasks can see improved performance via fine-tuning (vs. large model out-of-box)

# Open-Source Reasoning Models

Selecting Other Models To Be More Reasoning and Lower Price

# Alternative Reasoning LLMs



**Llama 3.3 70B Instruct:** This model from Meta has strong **mathematical reasoning** and code generation capabilities. It has a 128k-token context window and is comparable to top closed-source models like GPT-4o.



**DeepSeek R1** specifically designed for complex reasoning tasks, like logical inference and problem-solving, with a focus on providing accurate and structured solutions, often considered comparable to OpenAI's o1 model while being more cost-effective; it stands out due to its open-source nature and accessibility for both commercial and personal use.



**Microsoft's Phi-4 mini** outperforming models of similar and larger sizes across various benchmarks in language, reasoning, coding, and math but seems overfitted when we looked at MMLU.

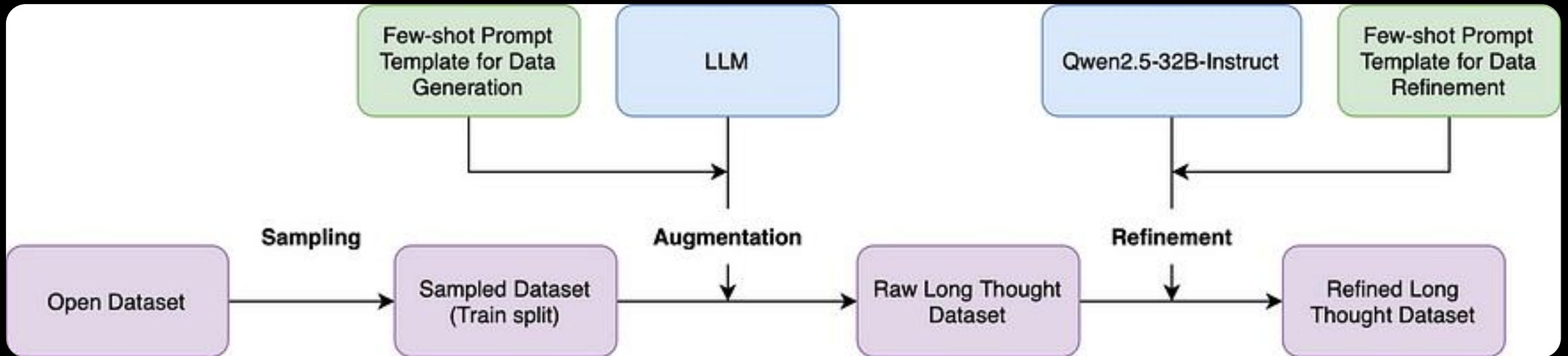


**Typhoon T1** is an open-source Thai reasoning model that uses large language models (LLMs) to generate a chain of thought before answering a question. It was developed by SCB 10X.

# Expanding SCB 10x Typhoon T1



**Typhoon T1** is an open-source Thai reasoning model that uses large language models (LLMs) to generate a chain of thought before answering a question. It was developed by SCB 10X.



Data Preparation Flow – SCB 10X



<thoughts>

<plan>

<step order="1">Understanding the scale relationship</step>

<step order="2">Setting up the proportion</step>

<step order="3">Cross-multiplying to solve for the model distance</step>

<step order="4">Calculating the final result</step>

<step order="5">Verifying the calculations</step>

</plan>

<step>

<title>Understanding the scale relationship</title>

<scratch\_pad>

The scale given is 1.5 cm to 50 m. This means that every 1.5 cm on the model corresponds to 50 meters in reality.

</scratch\_pad>

<summary>I'm clarifying the scale relationship to ensure accurate calculations.</summary>

<next\_step>Setting up the proportion</next\_step>

</step>

<step>

<title>Setting up the proportion</title>

<scratch\_pad>

Let  $(x)$  be the distance on the model (in centimeters). The proportion can be set up as follows:

$[$

$$\frac{1.5 \text{ cm}}{50 \text{ m}} = \frac{x \text{ cm}}{150 \text{ m}}$$

$]$

This represents the relationship between the model and the actual distance.

</scratch\_pad>

<summary>I've established the proportion based on the scale provided.</summary>

<next\_step>Cross-multiplying to solve for the model distance</next\_step>

</step>

...

</thoughts>

<response>

To find the distance between the two trees on the model, we use the scale provided.

### **\*\*Given:\*\***

- Scale: 1.5 cm corresponds to 50 m.
- Distance between the trees in reality: 150 m.

### **\*\*Step-by-step Calculation:\*\***

1. **\*\*Set up the proportion:\*\***

$$\left[ \frac{1.5 \text{ cm}}{50 \text{ m}} = \frac{x \text{ cm}}{150 \text{ m}} \right]$$

2. **\*\*Cross-multiply:\*\***

$$\left[ 1.5 \cdot 150 = 50 \cdot x \right]$$

Simplifying gives:

$$\left[ 225 = 50x \right]$$

3. **\*\*Solve for ( x ):\*\***

$$\left[ x = \frac{225}{50} = 4.5 \text{ cm} \right]$$

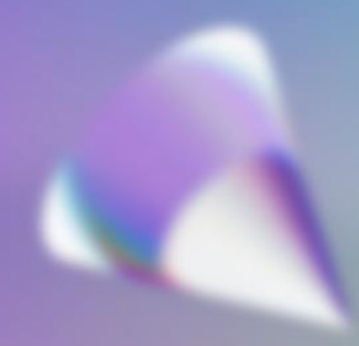
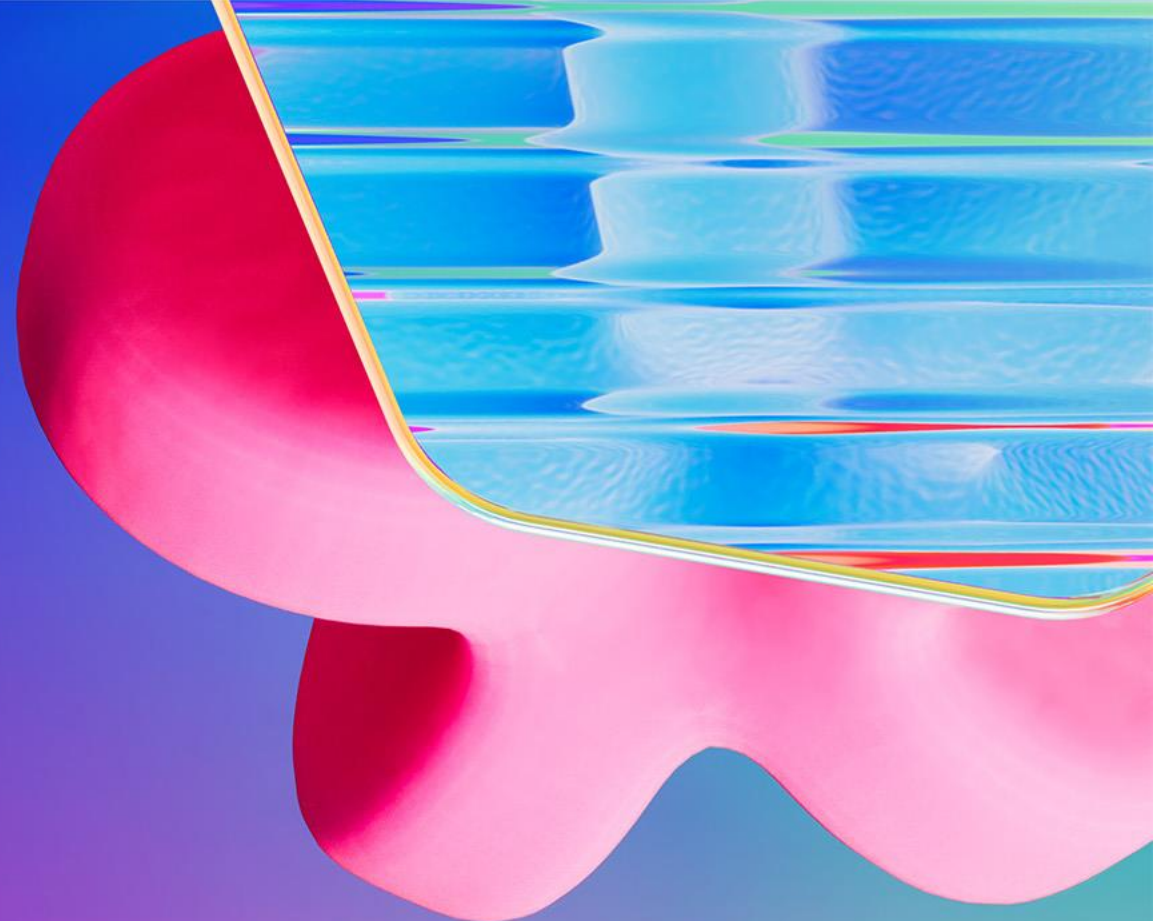
### **\*\*Final Answer:\*\***

The distance between the two trees on the model is **\*\*4.5 centimeters\*\***.

</response>

# Demo:

Comparing GPT-4o, o1-Preview, o3-mini-Preview,  
along with Open-sourced models in GitHub Models



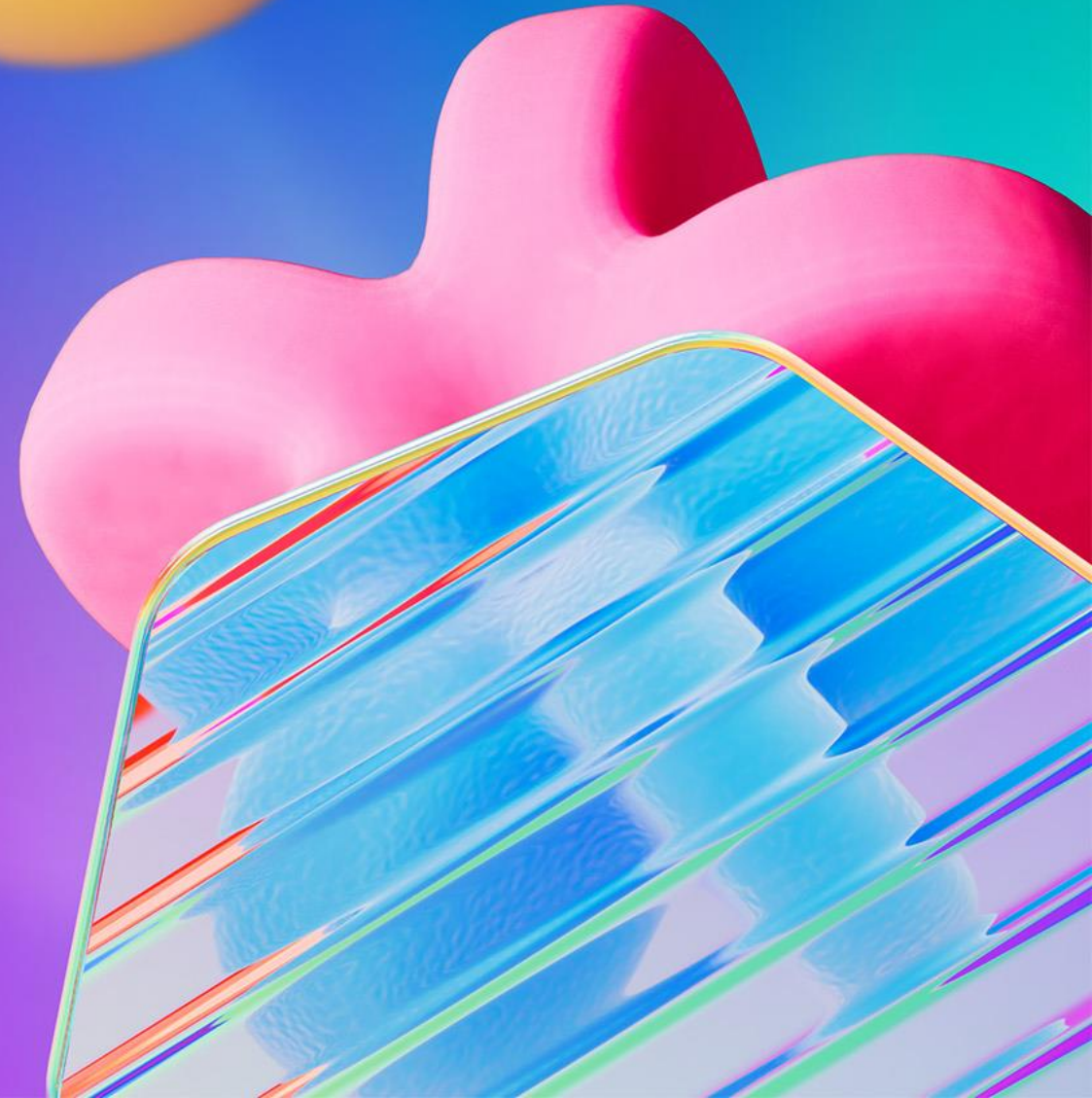
# Key Takeaways and FOSSASIA

What do we have learnt from this session....?

# Key Takeaway:

The o1 models are designed to tackle reasoning and problem-solving tasks with increased focus and capability.

Do not automatically upgrade everything to use the o1 model. It is a different class of reasoning model from GPT 4 series.



# Think it carefully, before using it!



February 26 at 1:03 PM · 



หากคุณใช้ model deep thinking ตอบคำถามบ่อยๆ คุณจะมีส่วนทำให้โลกร้อนขึ้นนะครับ 😂



1 comment



Like



Comment

Most relevant ▼



Somkiat Khitwongwattana

คำถาม:  $2+2$  ได้เท่าไร

ใช้ไฟหนักกว่าเครื่องคิดเลขร้อยเครื่อง 😂

1d **Haha** Reply Edited

3 😂

# All Models Are Not Same in The Usage!

Try To Use It Sustainably and Consider on Energy Consumption!





# FOSSASIA SUMMIT 2025

True Digital Park, Bangkok  
summit.fossasia.org

March 13-15

# Thank you for your participation

Hope we could see each other again  
next time! 🙌

Follow me at @boatchrnthn on  
Social Media and @chrnthnkmutt on  
GitHub



การประชุมเทคโนโลยีโอเพนซอร์สชั้นนำของเอเชีย

## Charunthon Limseelo

Microsoft Learn Student Ambassador  
King Mongkut University of  
Technology Thonburi (KMUTT)

Small Language Models: The New  
Frontier of Developing Open-source  
Generative AI to Sustainability Goals