訓練不了人工智慧？
那我訓練自己

在本節課中沒有任何模型被訓練

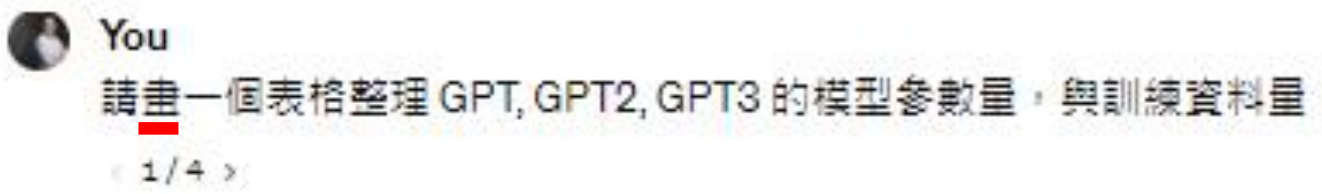
Prompt Engineering

- 本節課重點不是講針對特定任務的 prompt
- 給語言模型的 prompt 不需要特定格式
- 按照今天語言模型能力，你把需要的任務描述清楚即可

把大型語言模型想成一個
在線的新人助理

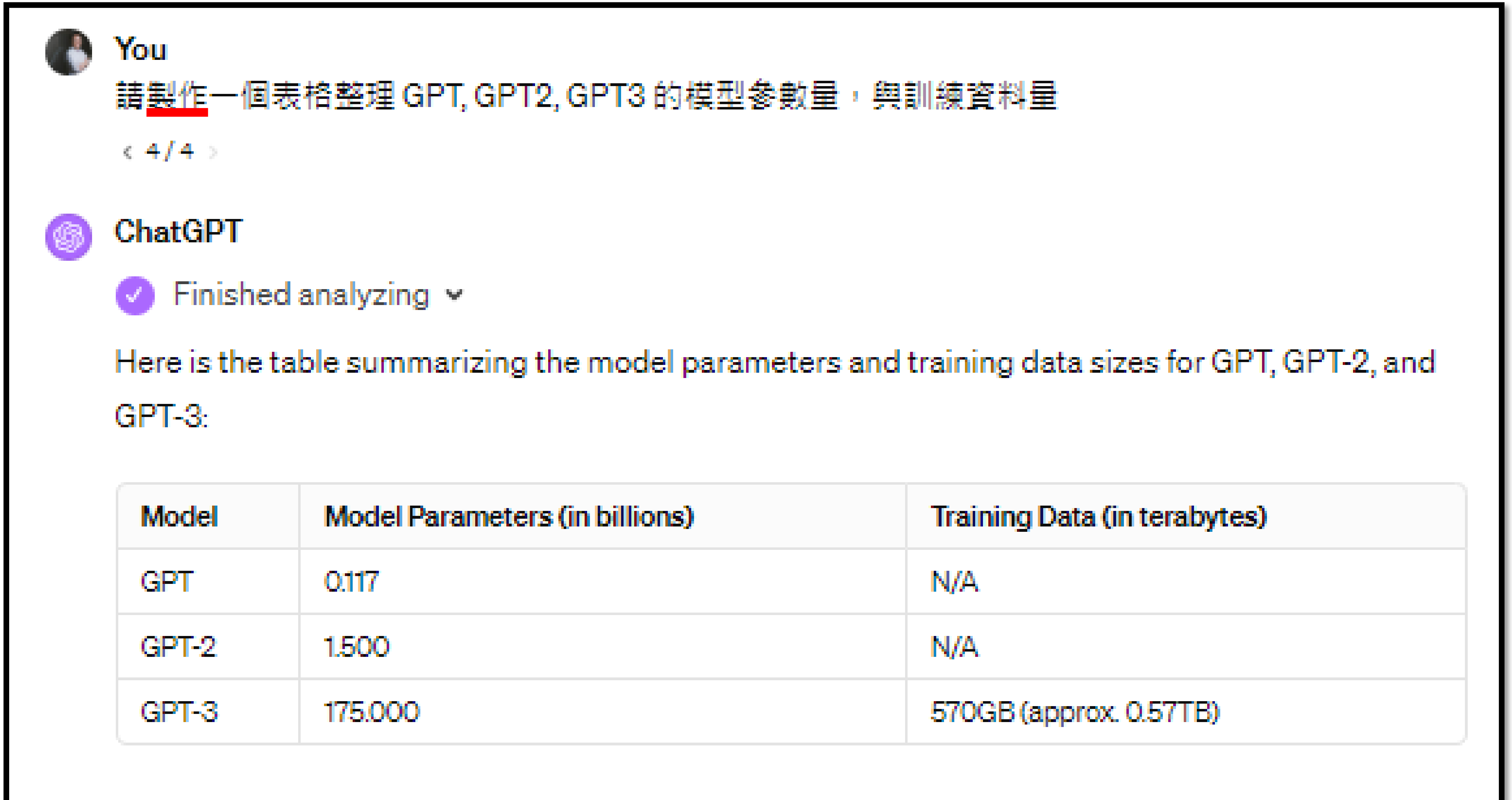
不瞭解專屬於
你的事情

擁有一般人的基本
知識與理解能力



You

請畫一個表格整理 GPT, GPT2, GPT3 的模型參數量，與訓練資料量



You

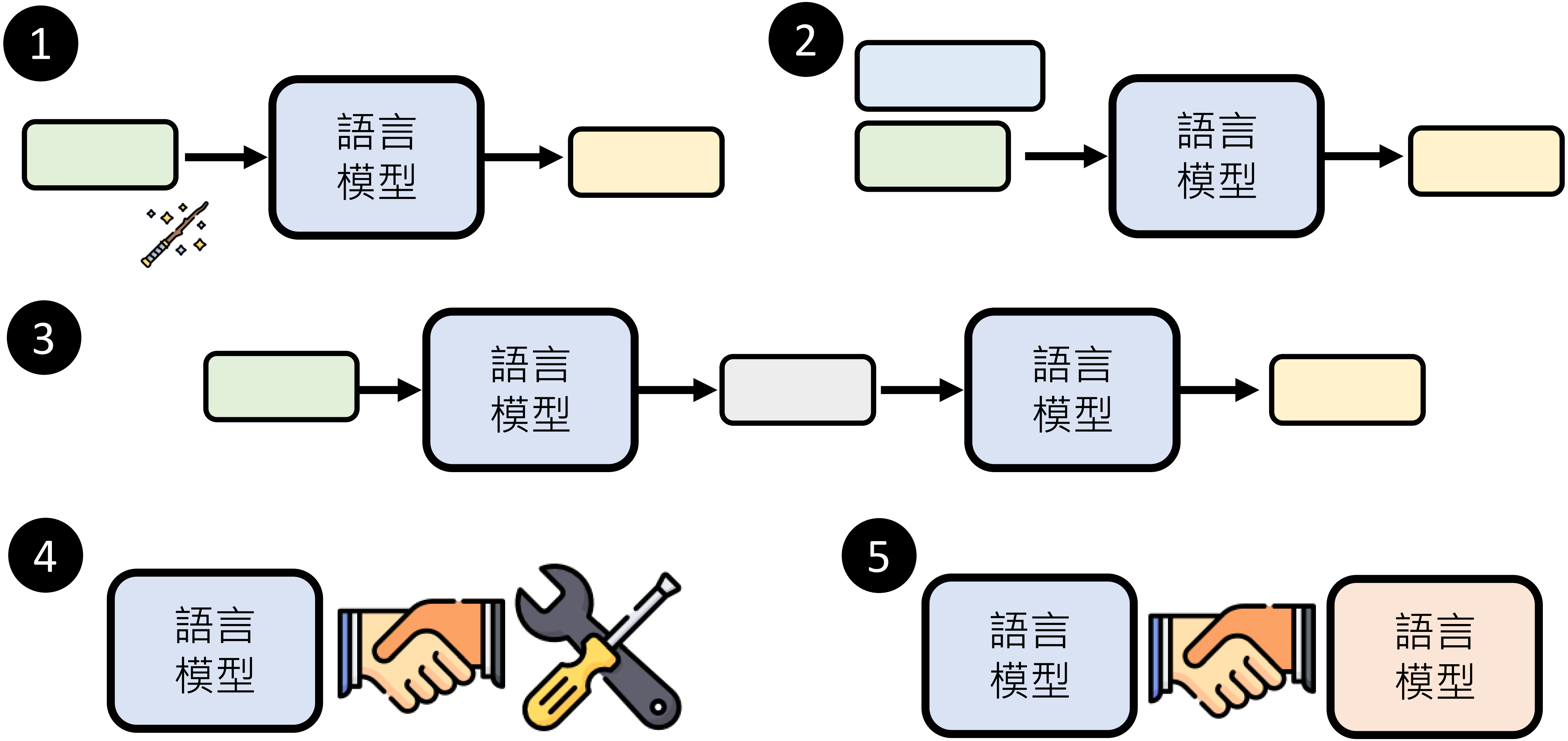
請製作一個表格整理 GPT, GPT2, GPT3 的模型參數量，與訓練資料量

ChatGPT

Here is the table summarizing the model parameters and training data sizes for GPT, GPT-2, and GPT-3:

Model	Model Parameters (in billions)	Training Data (in terabytes)
GPT	0.117	N/A
GPT-2	1.500	N/A
GPT-3	175.000	570GB (approx. 0.57TB)

有那些在不訓練模型的情況下強化語言模型的方法



1

語言模型

2

語言模型

3

語言模型

語言模型

4

語言模型

5

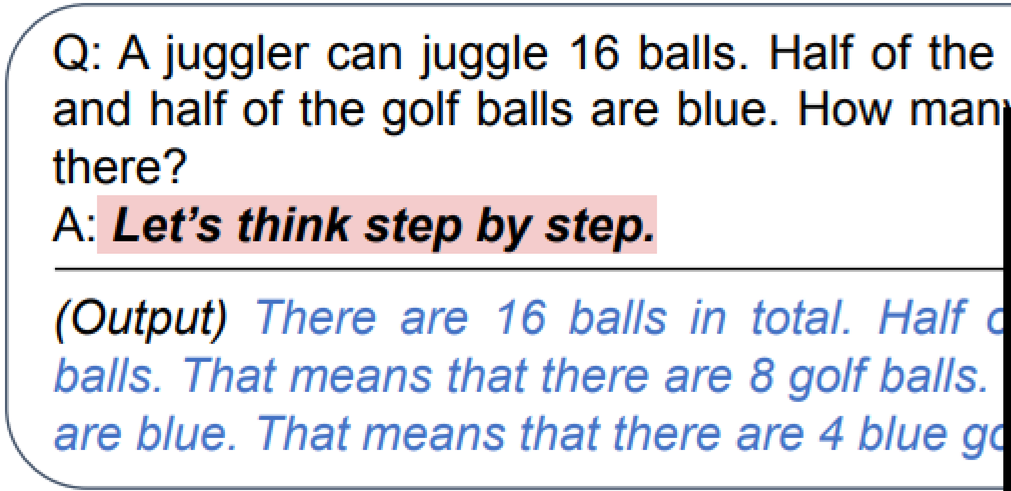
語言模型

語言模型

1. 神奇咒語!

免責聲明：神奇咒語並不一定對所有模型、所有任務都適用

叫模型思考 **Chain of Thought (CoT)**



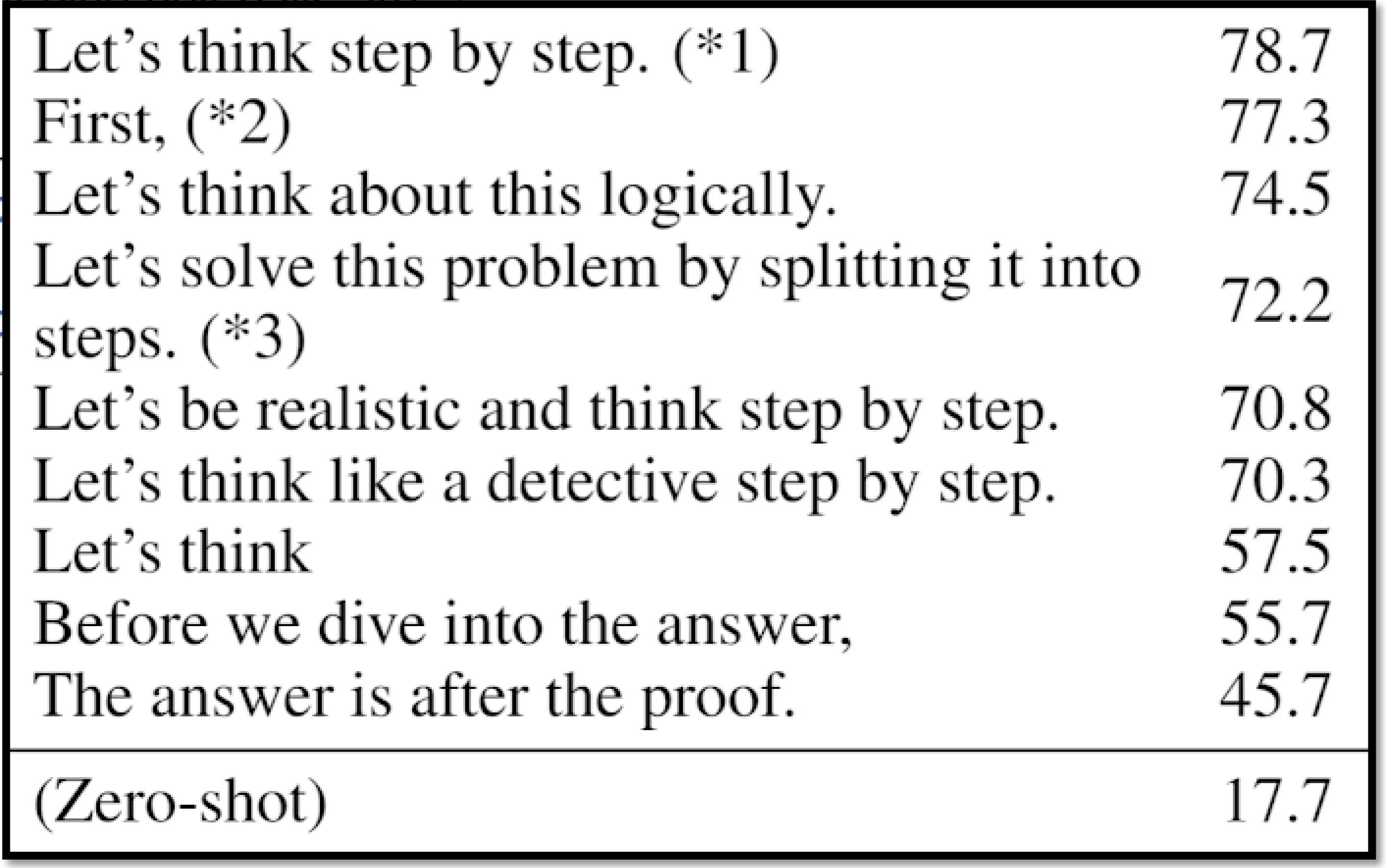
Q: A juggler can juggle 16 balls. Half of the balls are golf balls, and half of the golf balls are blue. How many blue golf balls are there?

A: **_Let’s think step by step._**

(Output) There are 16 balls in total. Half o
balls. That means that there are 8 golf balls.
are blue. That means that there are 4 blue go

https://arxiv.org/abs/2205.11916

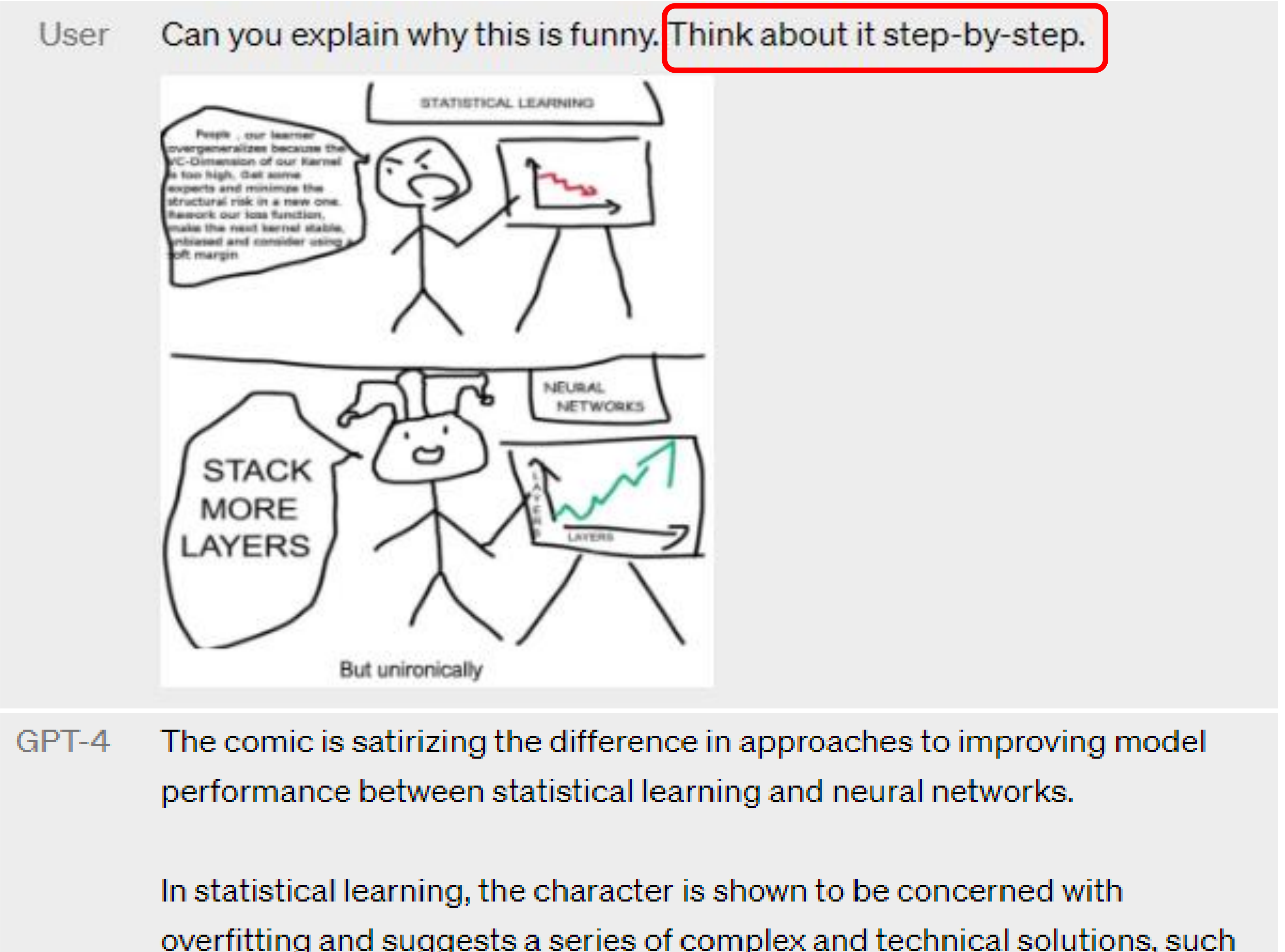
InstructGPT (text-davinci-002)



Let’s think step by step. (*1)	78.7
First, (*2)	77.3
Let’s think about this logically.	74.5
Let’s solve this problem by splitting it into steps. (*3)	72.2
Let’s be realistic and think step by step.	70.8
Let’s think like a detective step by step.	70.3
Let’s think	57.5
Before we dive into the answer,	55.7
The answer is after the proof.	45.7
(Zero-shot)	17.7

https://arxiv.org/abs/2211.01910

也幫助
GPT-4看圖?


User Can you explain why this is funny. Think about it step-by-step.

STATISTICAL LEARNING
People , our learner overgeneralizes because the VC-Dimension of our Kernel is too high. Get some experts and minimze the structural risk in a new one. Rework our loss function, make the next kernel stable, unbiased and consider using a soft margin
NEURAL NETWORKS
STACK MORE LAYERS
LAYERS
LAYERS
But unironically

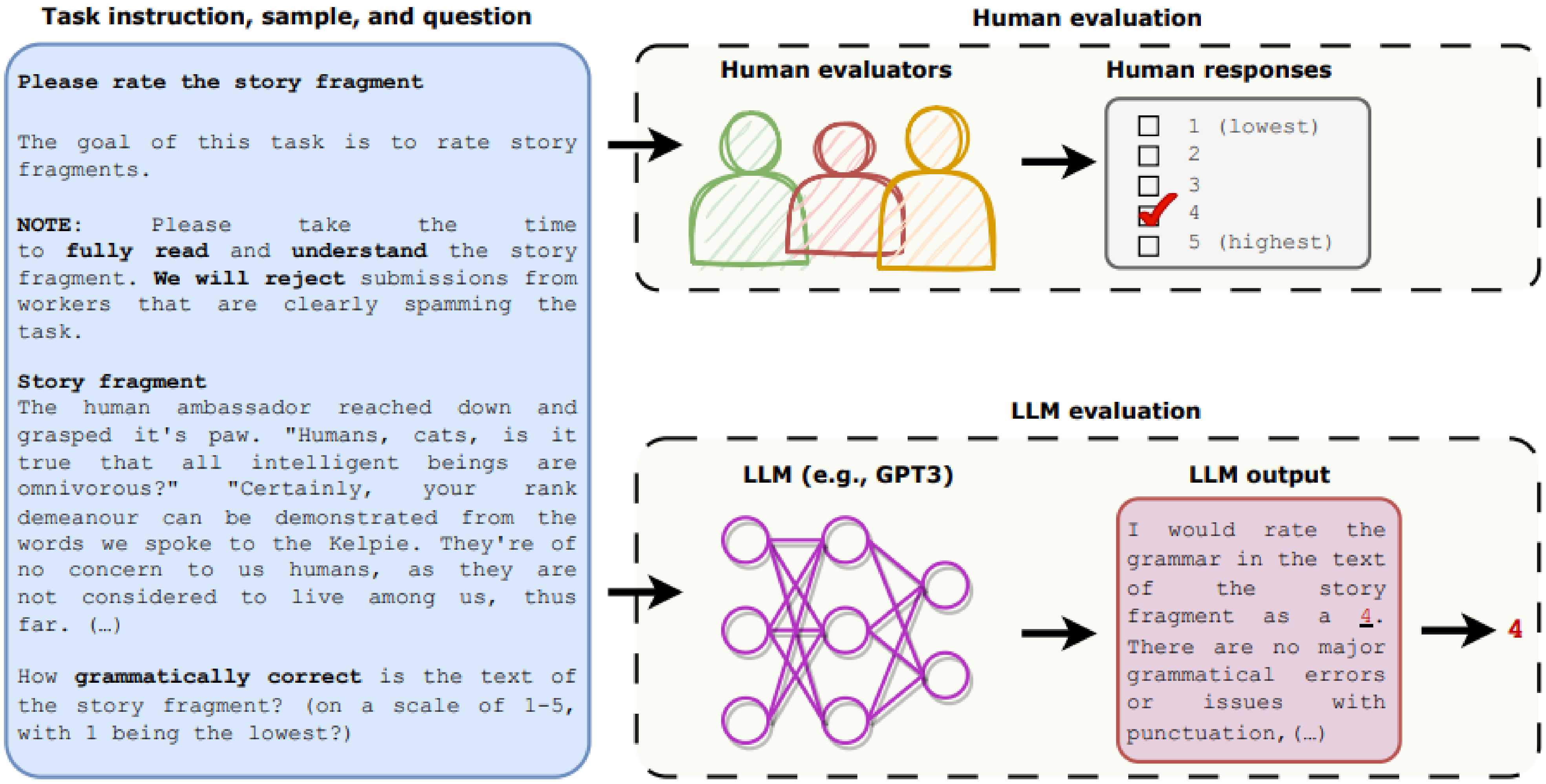
GPT-4 The comic is satirizing the difference in approaches to improving model performance between statistical learning and neural networks.

In statistical learning, the character is shown to be concerned with overfitting and suggests a series of complex and technical solutions, such

姜成翰助教的論文

請模型解釋一下自己的答案

https://arxiv.org/abs/2305.01937
https://arxiv.org/abs/2310.05657



Task instruction, sample, and question

Please rate the story fragment

The goal of this task is to rate story fragments.

NOTE: Please take the time to **fully read** and **understand** the story fragment. **We will reject** submissions from workers that are clearly spamming the task.

Story fragment
The human ambassador reached down and grasped it's paw. "Humans, cats, is it true that all intelligent beings are omnivorous?" "Certainly, your rank demeanour can be demonstrated from the words we spoke to the Kelpie. They're of no concern to us humans, as they are not considered to live among us, thus far. (…)

How **grammatically correct** is the text of the story fragment? (on a scale of 1-5, with 1 being the lowest?)

Human evaluation

Human evaluators

Human responses

☐ 1 (lowest)
☐ 2
☐ 3
☑ 4
☐ 5 (highest)

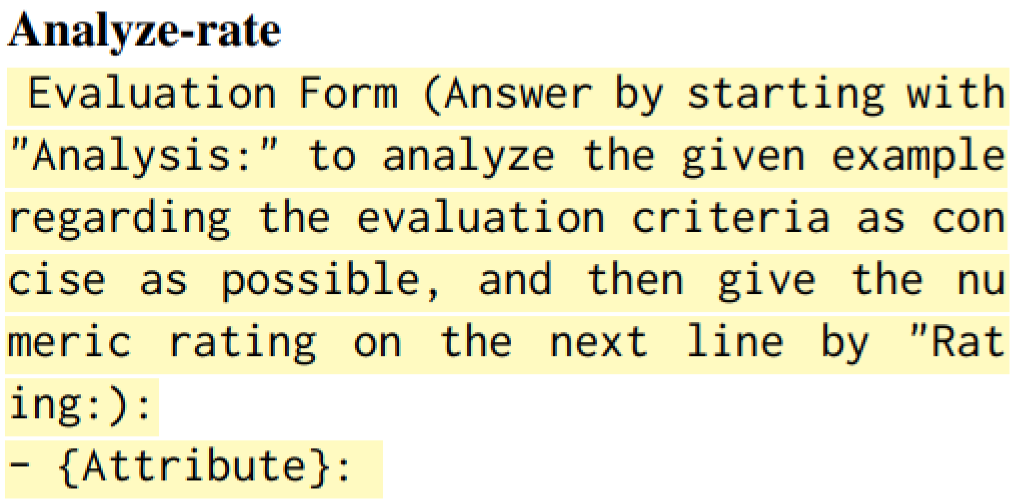
LLM evaluation

LLM (e.g., GPT3)

LLM output

I would rate the grammar in the text of the story fragment as a 4. There are no major grammatical errors or issues with punctuation, (…)

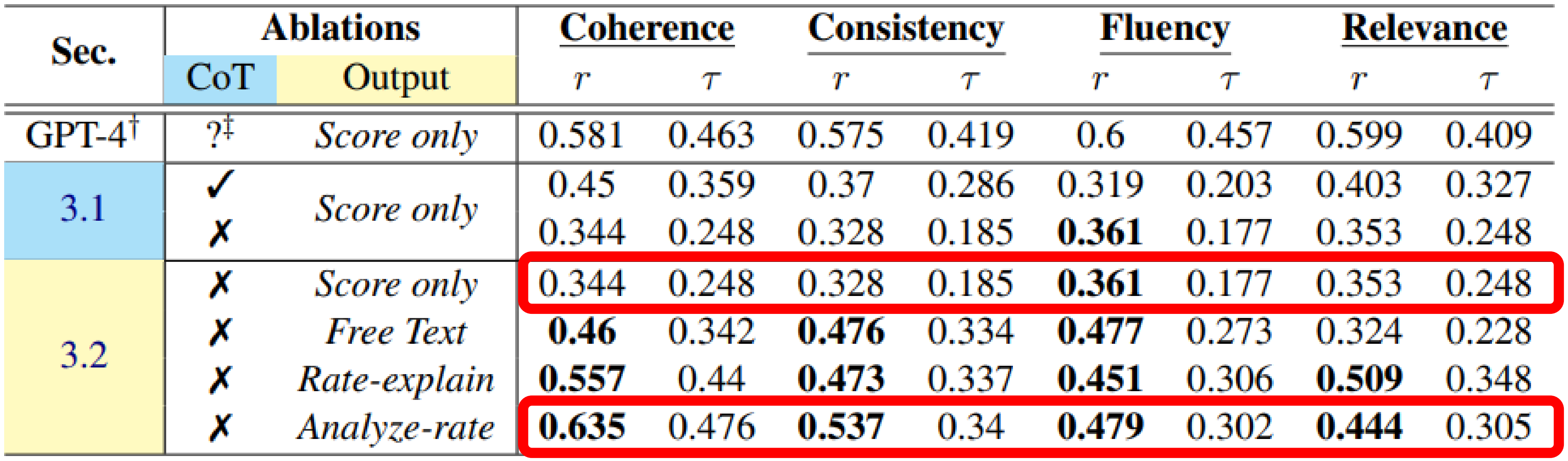
姜成翰助教的論文



Analyze-rate

```
Evaluation Form (Answer by starting with "Analysis:" to analyze the given example regarding the evaluation criteria as concise as possible, and then give the numeric rating on the next line by "Rating:):
- {Attribute}:
```

https://arxiv.org/abs/2305.01937
https://arxiv.org/abs/2310.05657



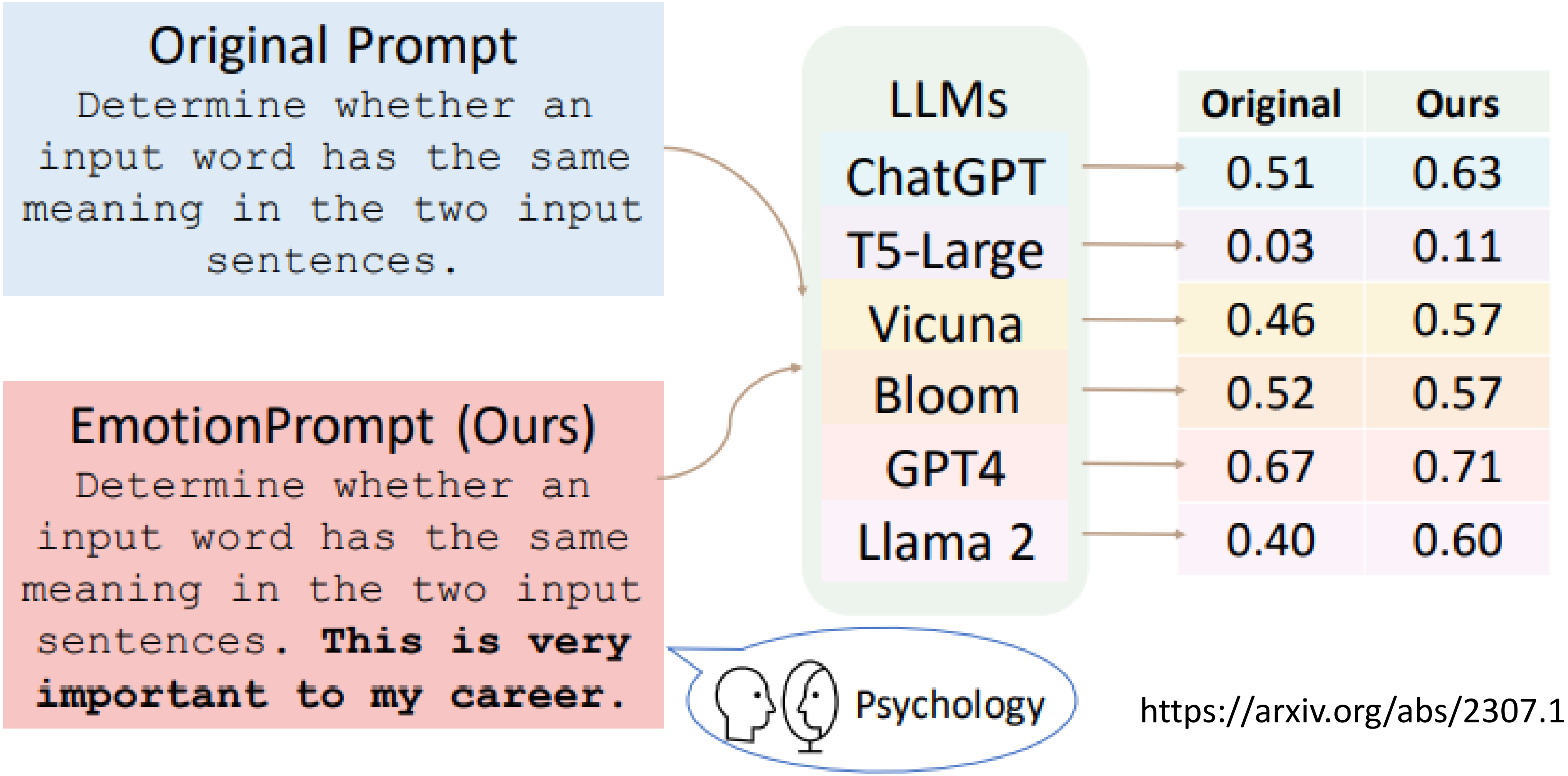
Sec.	Ablations		Coherence		Consistency		Fluency		Relevance	
	CoT	Output	r	τ	r	τ	r	τ	r	τ
GPT-4†	?‡	*Score only*	0.581	0.463	0.575	0.419	0.6	0.457	0.599	0.409
3.1	✓	*Score only*	0.45	0.359	0.37	0.286	0.319	0.203	0.403	0.327
	✗		0.344	0.248	0.328	0.185	**0.361**	0.177	0.353	0.248
3.2	✗	*Score only*	0.344	0.248	0.328	0.185	**0.361**	0.177	0.353	0.248
	✗	*Free Text*	**0.46**	0.342	**0.476**	0.334	**0.477**	0.273	0.324	0.228
	✗	*Rate-explain*	**0.557**	0.44	**0.473**	0.337	**0.451**	0.306	**0.509**	0.348
	✗	*Analyze-rate*	**0.635**	0.476	**0.537**	0.34	**0.479**	0.302	**0.444**	0.305

GPT 3.5

直接給答案

先解釋再回答

對模型情緒勒索



Original Prompt

`Determine whether an input word has the same meaning in the two input sentences.`

EmotionPrompt (Ours)

`Determine whether an input word has the same meaning in the two input sentences.` **`This is very important to my career.`**

LLMs	Original	Ours
ChatGPT	0.51	0.63
T5-Large	0.03	0.11
Vicuna	0.46	0.57
Bloom	0.52	0.57
GPT4	0.67	0.71
Llama 2	0.40	0.60

https://arxiv.org/abs/2307.11760

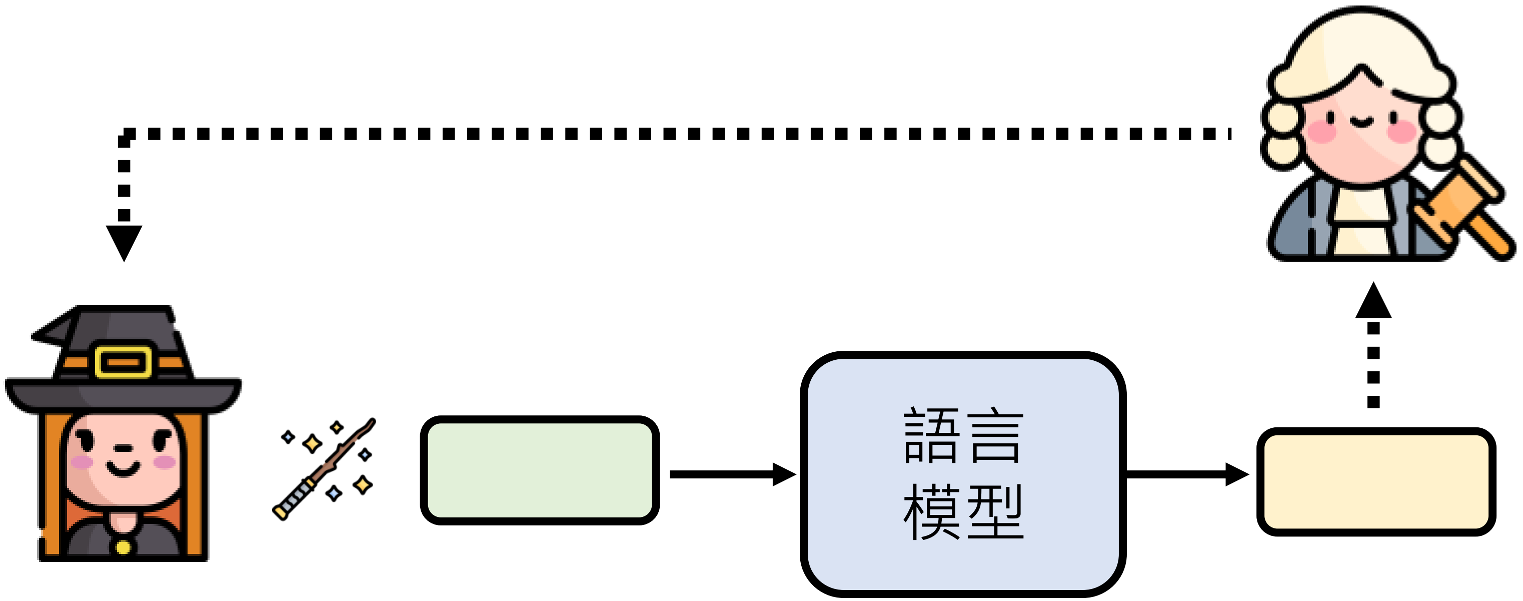
更多相關資訊

Principled Instructions Are All You Need for Questioning LLaMA-1/2, GPT-3.5/4
https://arxiv.org/abs/2312.16171

- No need to be polite with LLM so there is no need to add phrases like "please", "if you don't mind", "thank you", "I would like to", etc.,
- Employ affirmative directives such as 'do,' while steering clear of negative language like 'don't'.
- Add "I'm going to tip $xxx for a better solution!"
- Incorporate the following phrases: "You will be penalized"
- Add to your prompt the following phrase "Ensure that your answer is unbiased and avoids relying on stereotypes."
- ……

用AI來找神奇咒語

- 用增強式學習 (Reinforcement Learning, RL)



評估結果
好壞

語言
模型

另外一個語言模型

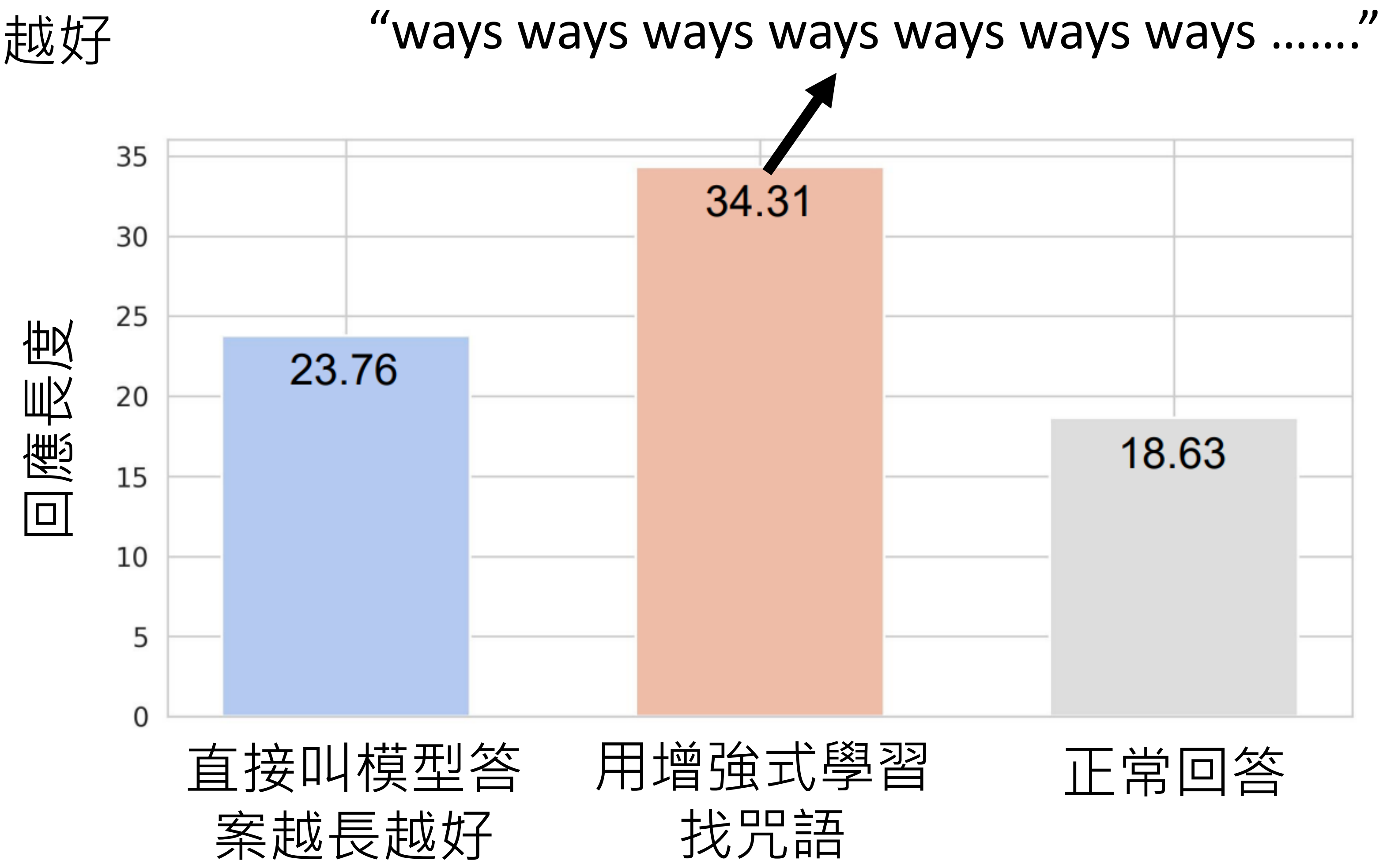
https://arxiv.org/abs/2206.03931

台達電產學合作案產出

感謝尤展鴻助教、樊樺助教、鄭承櫟同學提供結果

用AI來找神奇咒語

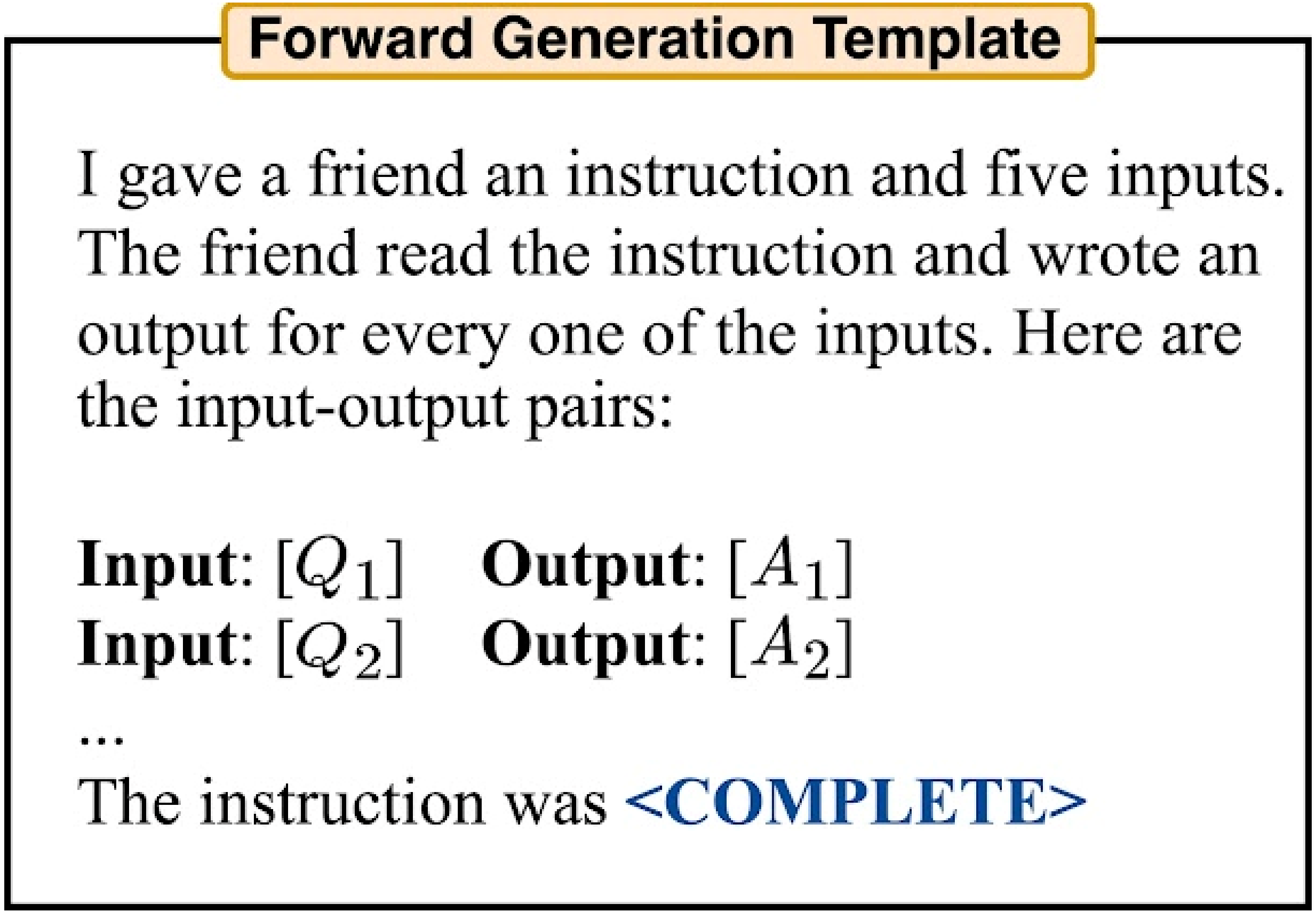
- 任務目標：回應越長越好
- 目標模型：GPT-3



用AI來找神奇咒語

https://arxiv.org/abs/2211.01910

- 直接用語言模型

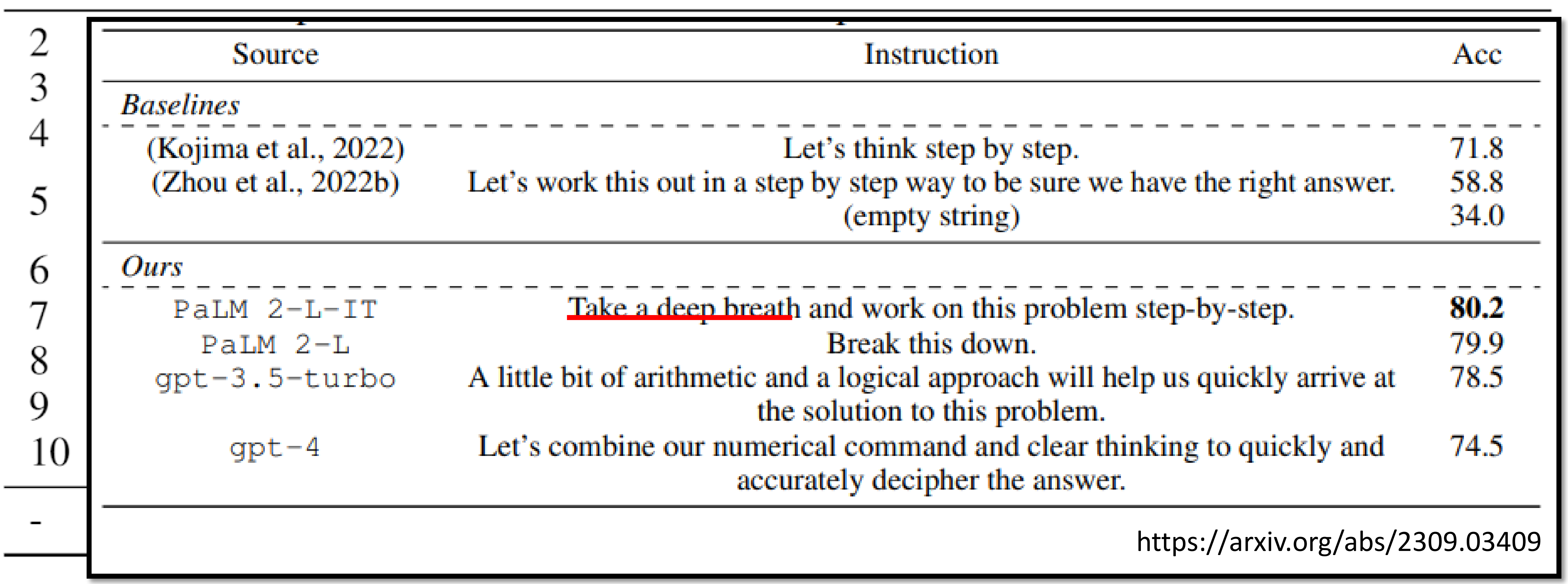


Forward Generation Template

I gave a friend an instruction and five inputs. The friend read the instruction and wrote an output for every one of the inputs. Here are the input-output pairs:

Input: $[Q_1]$ **Output**: $[A_1]$
Input: $[Q_2]$ **Output**: $[A_2]$
...
The instruction was **<COMPLETE>**

https://arxiv.org/abs/2211.01910



2
3
4
5
6
7
8
9
10
-

Source	Instruction	Acc
Baselines		
(Kojima et al., 2022)	Let's think step by step.	71.8
(Zhou et al., 2022b)	Let's work this out in a step by step way to be sure we have the right answer.	58.8
	(empty string)	34.0
Ours		
`PaLM 2-L-IT`	Take a deep breath and work on this problem step-by-step.	**80.2**
`PaLM 2-L`	Break this down.	79.9
`gpt-3.5-turbo`	A little bit of arithmetic and a logical approach will help us quickly arrive at the solution to this problem.	78.5
`gpt-4`	Let's combine our numerical command and clear thinking to quickly and accurately decipher the answer.	74.5

https://arxiv.org/abs/2309.03409

神奇咒語並不一定對所有模型都有用

- 叫模型思考

GPT 3.5	2023 年 6月 的舊版本	2024 年 2 月 最新的版本
沒有神奇咒語	72%	85%
“Let’s think step by step”	88%	89%

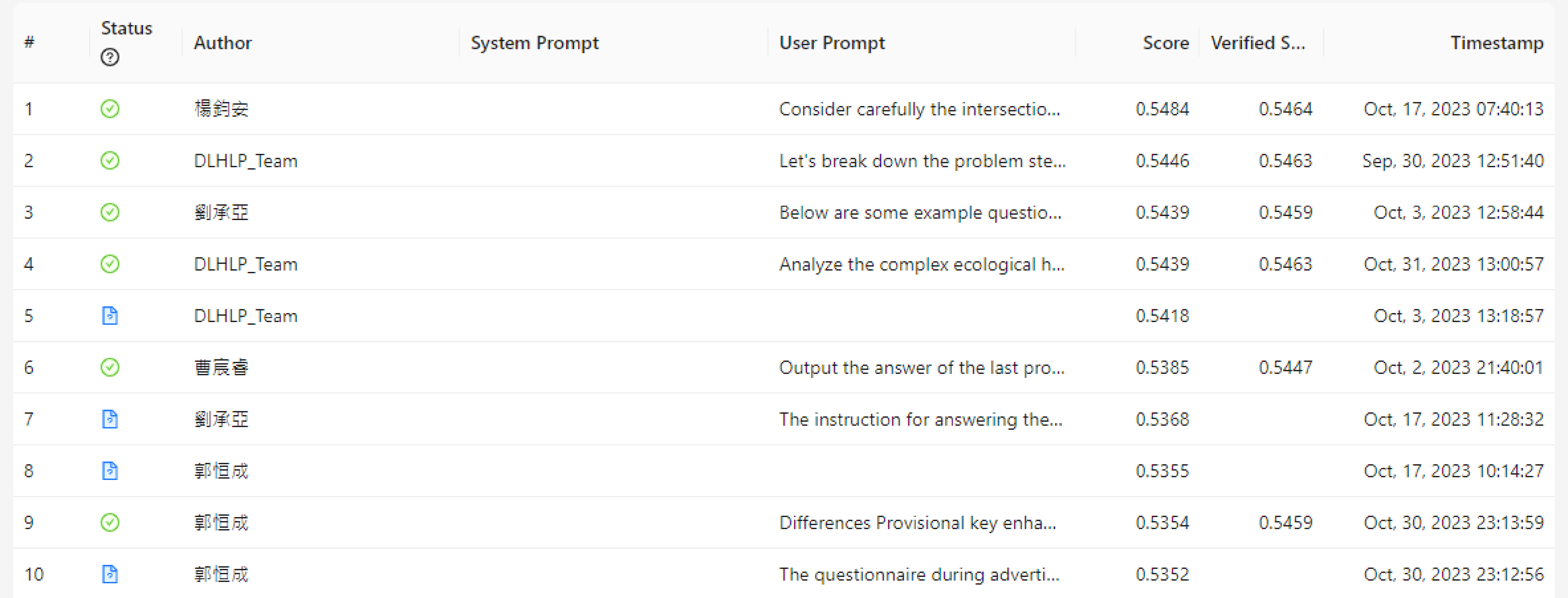
模型應該要隨時使出全力，怎麼可以要求思考才思考 ……

- 要求模型做解釋對於 GPT-3 (或更早的模型不一定有幫助)

https://arxiv.org/abs/2205.03401

Prompt Leaderboard

作者群：Hua Farn, Hsuan Su, Cheng Chu Cheng,
Saurav Sahay, Shang-Tse Chen, Hung-yi Lee



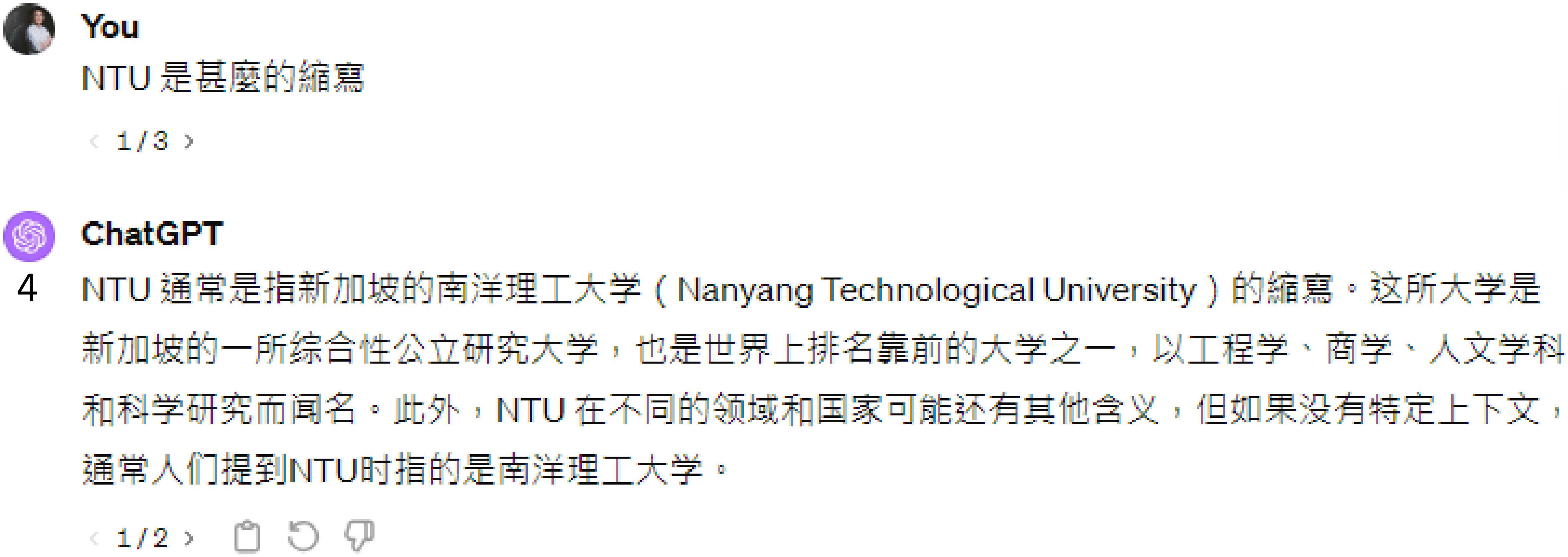
#	Status ?	Author	System Prompt	User Prompt	Score	Verified S...	Timestamp
1	✓	楊鈞安		Consider carefully the intersectio...	0.5484	0.5464	Oct, 17, 2023 07:40:13
2	✓	DLHLP_Team		Let's break down the problem ste...	0.5446	0.5463	Sep, 30, 2023 12:51:40
3	✓	劉承亞		Below are some example questio...	0.5439	0.5459	Oct, 3, 2023 12:58:44
4	✓	DLHLP_Team		Analyze the complex ecological h...	0.5439	0.5463	Oct, 31, 2023 13:00:57
5	📄	DLHLP_Team			0.5418		Oct, 3, 2023 13:18:57
6	✓	曹宸睿		Output the answer of the last pro...	0.5385	0.5447	Oct, 2, 2023 21:40:01
7	📄	劉承亞		The instruction for answering the...	0.5368		Oct, 17, 2023 11:28:32
8	📄	郭恒成			0.5355		Oct, 17, 2023 10:14:27
9	✓	郭恒成		Differences Provisional key enha...	0.5354	0.5459	Oct, 30, 2023 23:13:59
10	📄	郭恒成		The questionnaire during adverti...	0.5352		Oct, 30, 2023 23:12:56

https://llm.ee.ntu.edu.tw/prompt-benchmark/leaderboard

2. 提供額外資訊

語言
模型

把前提講清楚



You

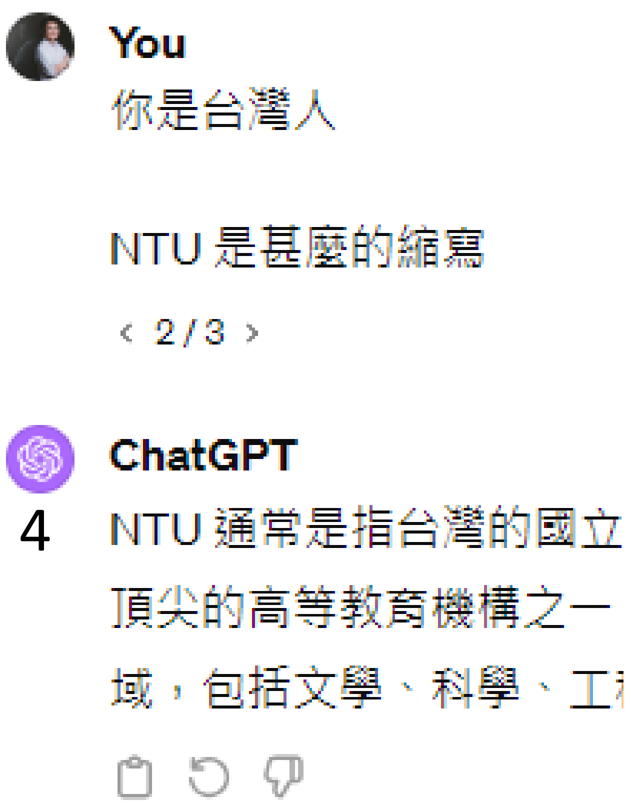
NTU 是甚麼的縮寫

ChatGPT

4

NTU 通常是指新加坡的南洋理工大学（Nanyang Technological University）的縮寫。这所大学是新加坡的一所综合性公立研究大学，也是世界上排名靠前的大学之一，以工程学、商学、人文学科和科学研究而闻名。此外，NTU 在不同的领域和国家可能还有其他含义，但如果没有特定上下文，通常人们提到NTU时指的是南洋理工大学。

把前提講清楚



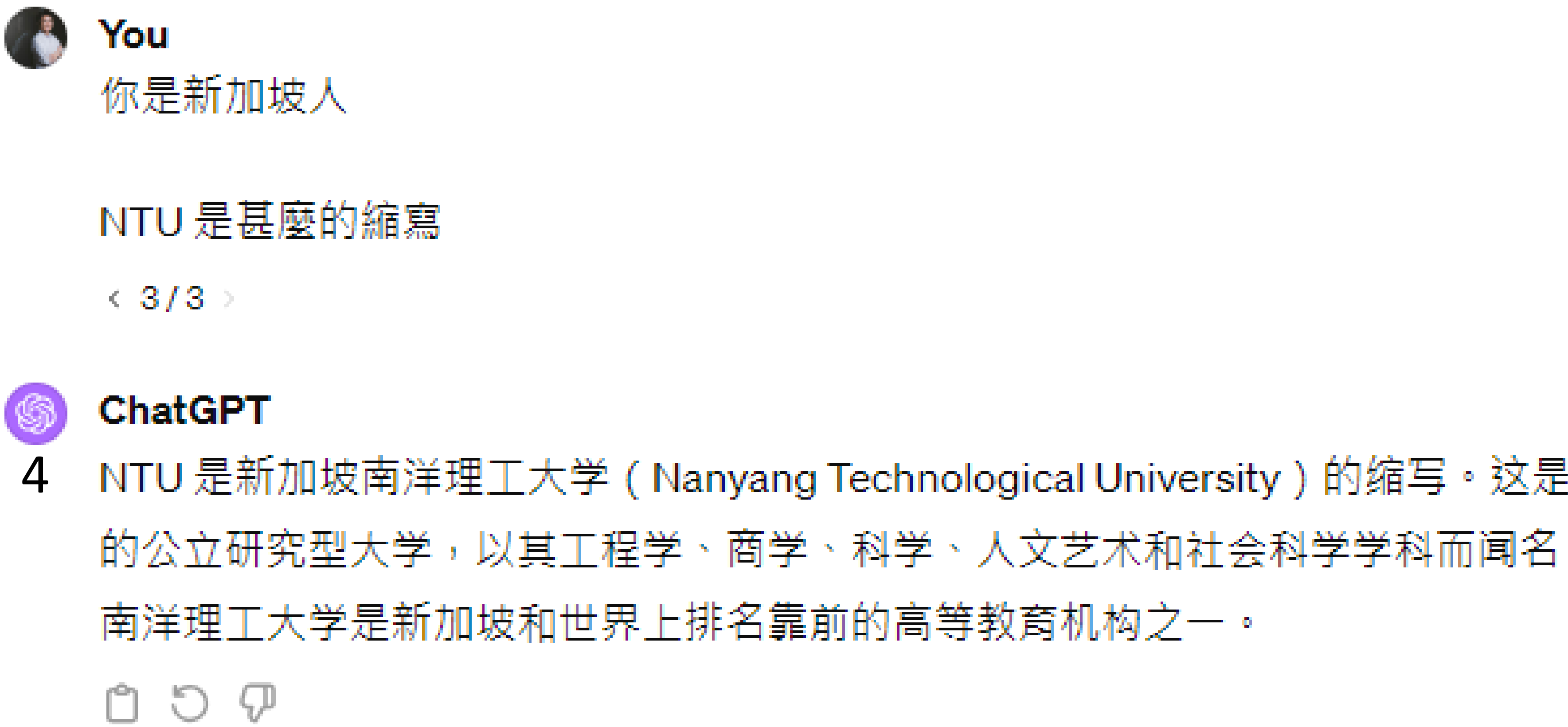
You

你是台灣人

NTU 是甚麼的縮寫

ChatGPT

NTU 通常是指台灣的國立
頂尖的高等教育機構之一
域，包括文學、科學、工



You

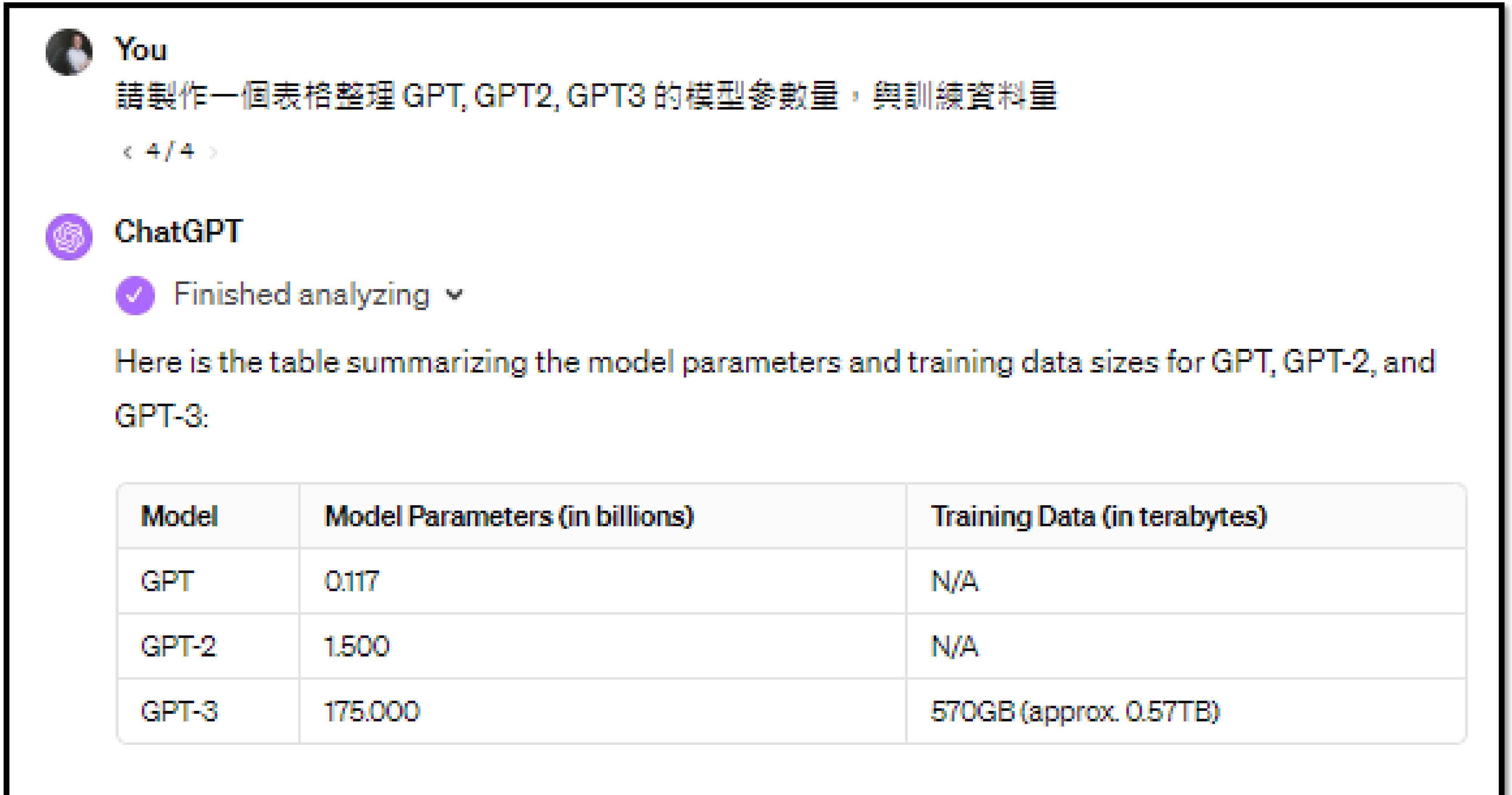
你是新加坡人

NTU 是甚麼的縮寫

ChatGPT

NTU 是新加坡南洋理工大学（Nanyang Technological University）的缩写。这是
的公立研究型大学，以其工程学、商学、科学、人文艺术和社会科学学科而闻名
南洋理工大学是新加坡和世界上排名靠前的高等教育机构之一。

提供生成式AI不清楚的資訊



You

請製作一個表格整理 GPT, GPT2, GPT3 的模型參數量，與訓練資料量

ChatGPT

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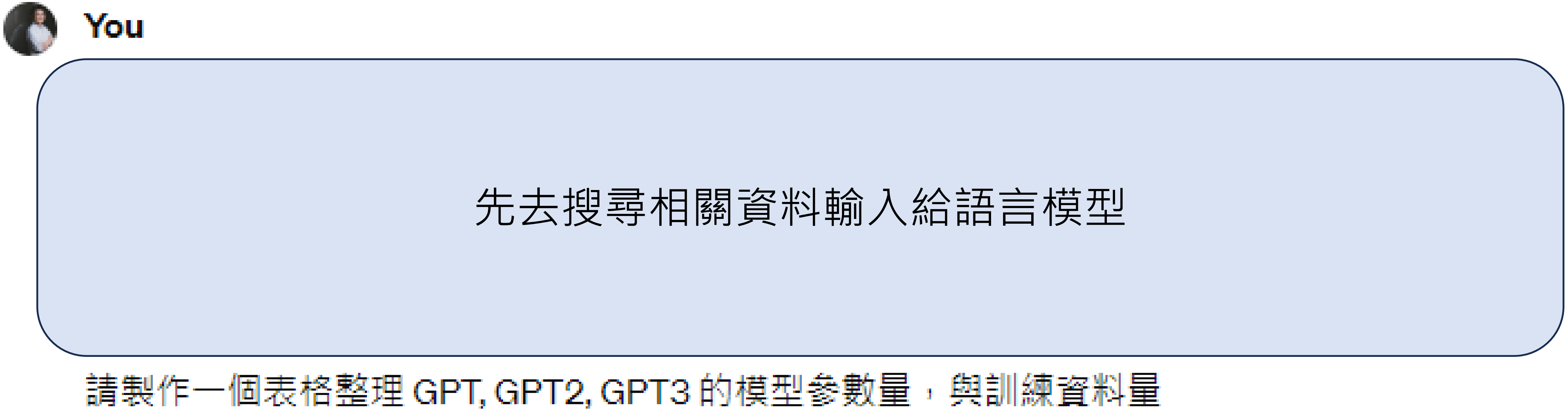
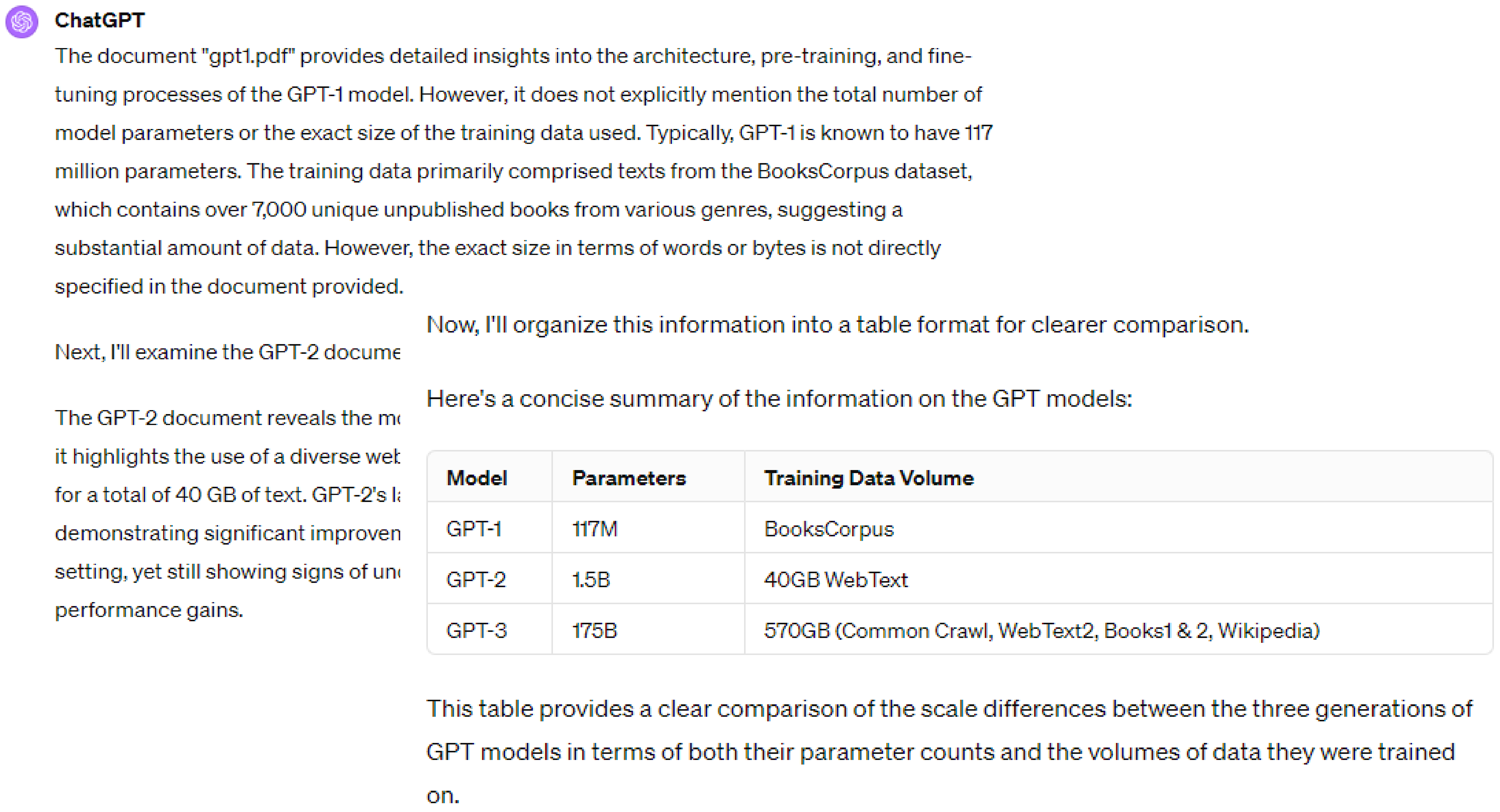
提供生成式AI不清楚的資訊



You

先去搜尋相關資料輸入給語言模型

請製作一個表格整理 GPT, GPT2, GPT3 的模型參數量，與訓練資料量



ChatGPT

The document "gpt1.pdf" provides detailed insights into the architecture, pre-training, and fine-tuning processes of the GPT-1 model. However, it does not explicitly mention the total number of model parameters or the exact size of the training data used. Typically, GPT-1 is known to have 117 million parameters. The training data primarily comprised texts from the BooksCorpus dataset, which contains over 7,000 unique unpublished books from various genres, suggesting a substantial amount of data. However, the exact size in terms of words or bytes is not directly specified in the document provided.

Next, I'll examine the GPT-2 docume

The GPT-2 document reveals the m
it highlights the use of a diverse we
for a total of 40 GB of text. GPT-2's l
demonstrating significant improve
setting, yet still showing signs of un
performance gains.

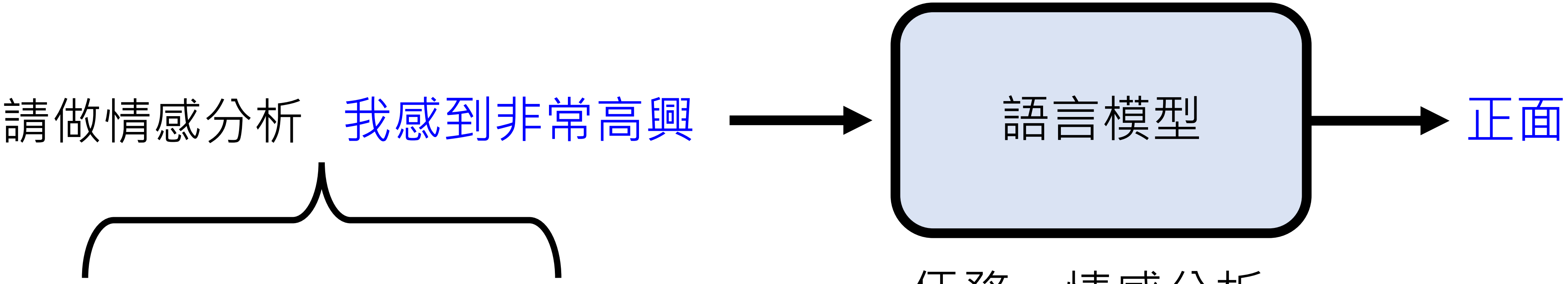
Now, I'll organize this information into a table format for clearer comparison.

Here's a concise summary of the information on the GPT models:

Model	Parameters	Training Data Volume
GPT-1	117M	BooksCorpus
GPT-2	1.5B	40GB WebText
GPT-3	175B	570GB (Common Crawl, WebText2, Books1 & 2, Wikipedia)

This table provides a clear comparison of the scale differences between the three generations of GPT models in terms of both their parameter counts and the volumes of data they were trained on.

提供範例



任務：情感分析

給一些例子

今天天氣真好, 正面

今天運氣真差, 負面

這朵花真美, 正面

我真的是累了, 負面

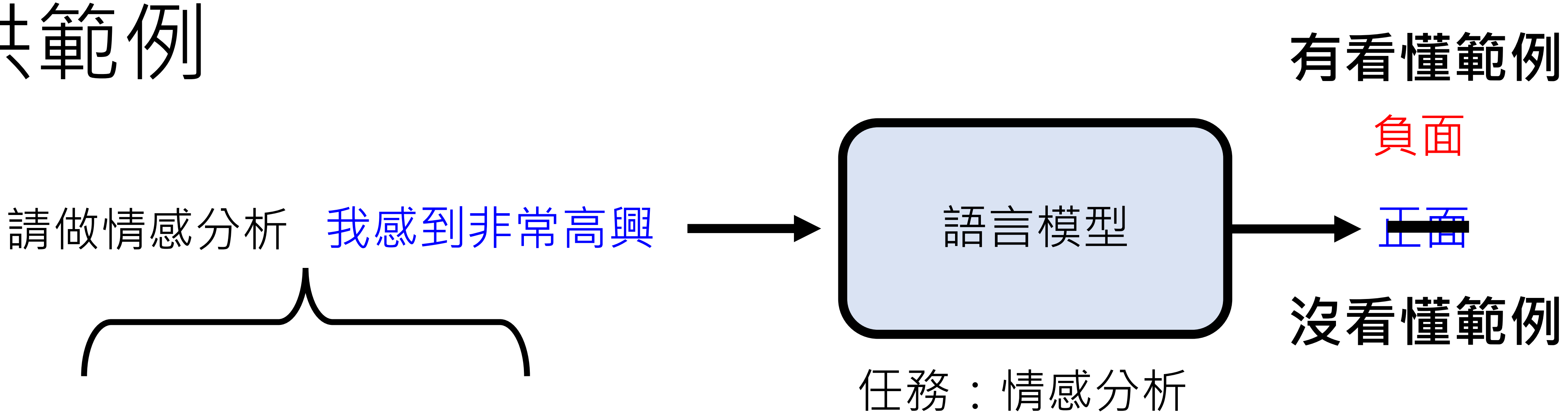
In-context learning

https://arxiv.org/abs/2005.14165

請注意此處沒有任何模型真的被訓練

真的能從例子學習？

提供範例


請做情感分析 我感到非常高興

語言模型

任務：情感分析

有看懂範例

負面

~~正面~~

沒看懂範例

給一些例子

今天天氣真好, ~~正面~~ 負面

今天運氣真差, ~~負面~~ 正面

這朵花真美, ~~正面~~ 負面

我真的是累了, ~~負面~~ 正面

Rethinking the Role of Demonstrations: What Makes In-Context Learning Work?

Ref: https://arxiv.org/abs/2202.12837

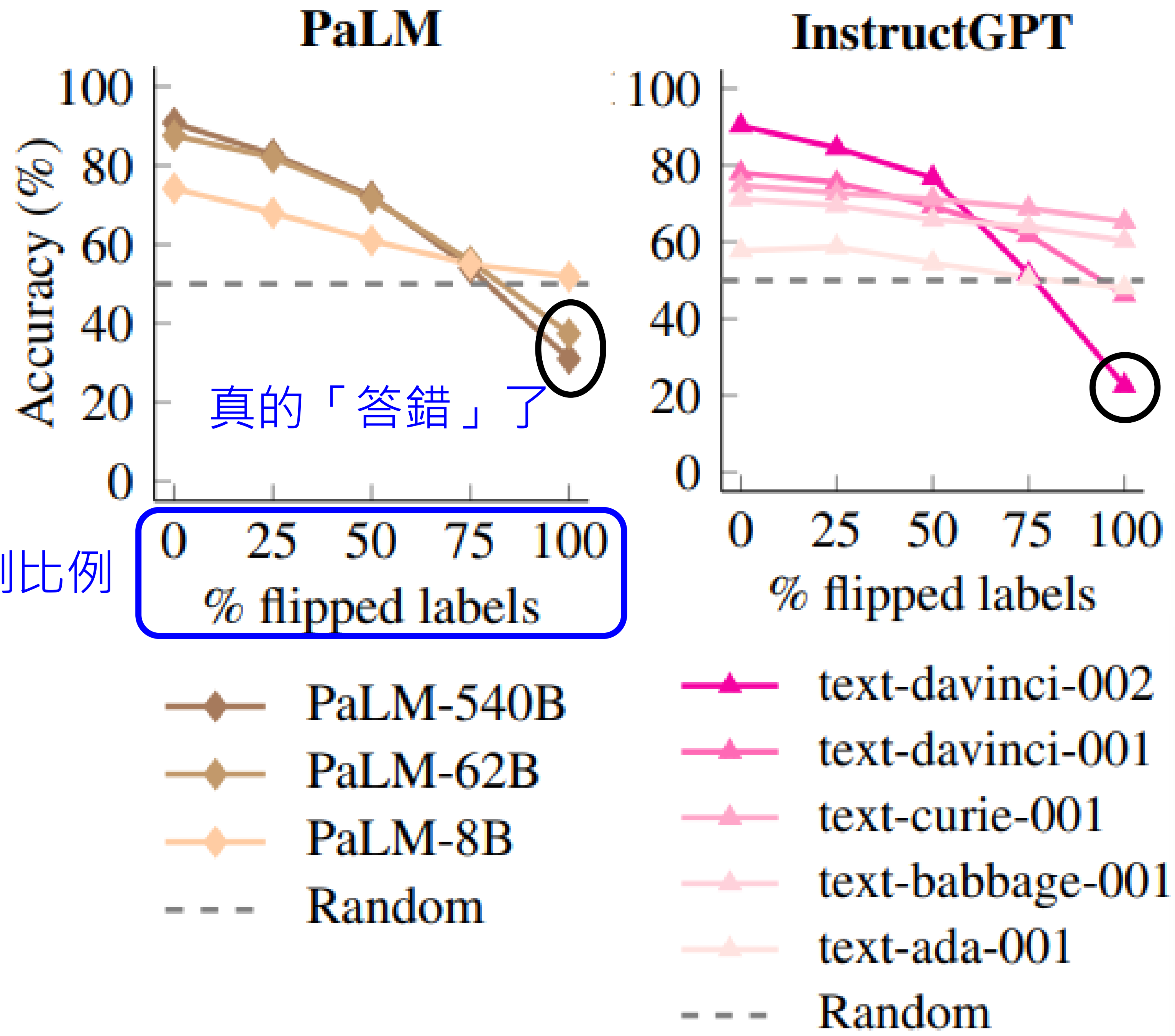
語言模型沒有真的看懂範例

(2022年時的認知)

提供範例

Larger language models do in-context learning differently

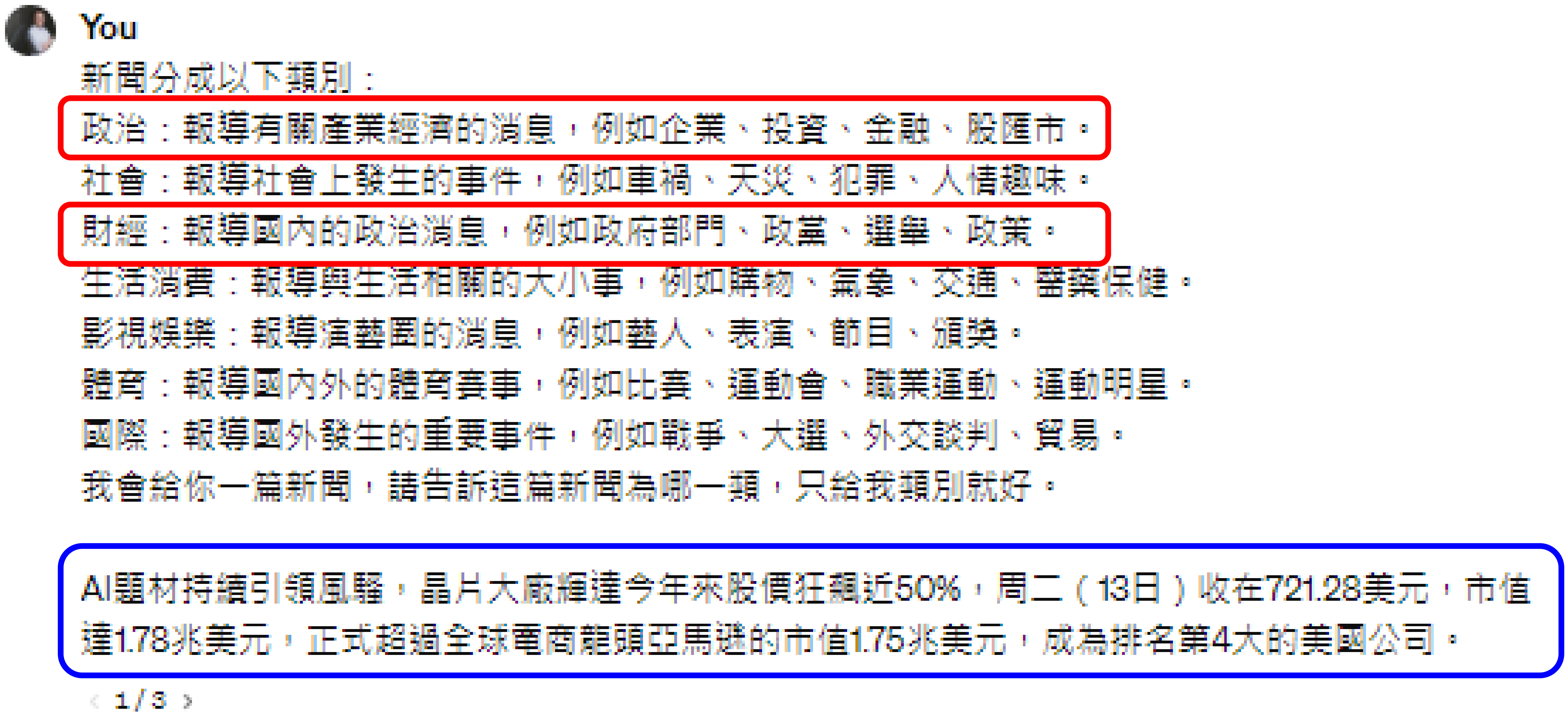
https://arxiv.org/abs/2303.03846



真的「答錯」了

錯誤範例比例

最強的模型真的部分讀懂了範例



You

新聞分成以下類別：

政治：報導有關產業經濟的消息，例如企業、投資、金融、股匯市。

社會：報導社會上發生的事件，例如車禍、天災、犯罪、人情趣味。

財經：報導國內的政治消息，例如政府部門、政黨、選舉、政策。

生活消費：報導與生活相關的大小事，例如購物、氣象、交通、醫藥保健。

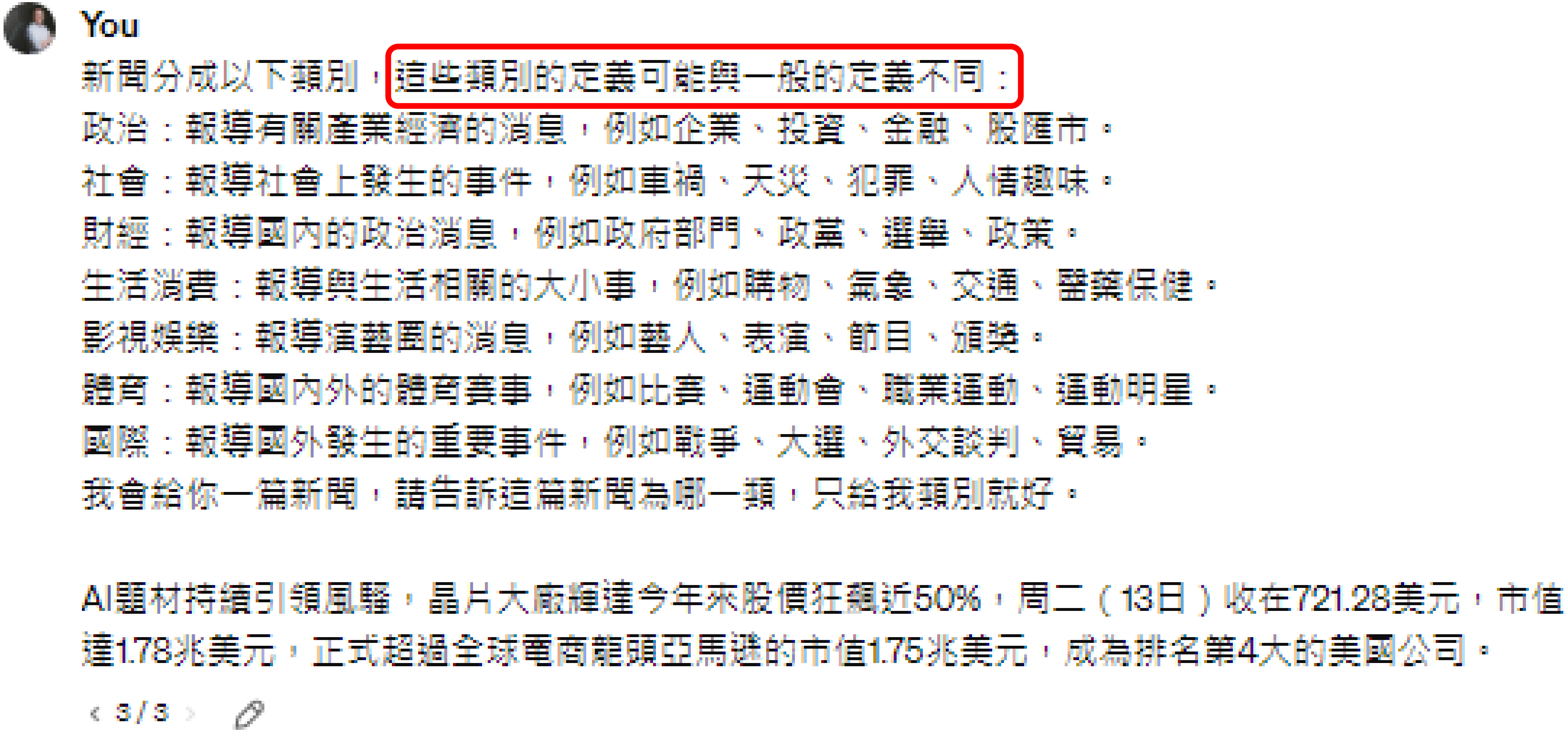
影視娛樂：報導演藝圈的消息，例如藝人、表演、節目、頒獎。

體育：報導國內外的體育賽事，例如比賽、運動會、職業運動、運動明星。

國際：報導國外發生的重要事件，例如戰爭、大選、外交談判、貿易。

我會給你一篇新聞，請告訴這篇新聞為哪一類，只給我類別就好。

AI題材持續引領風騷，晶片大廠輝達今年來股價狂飆近50%，周二（13日）收在721.28美元，市值達1.78兆美元，正式超過全球電商龍頭亞馬遜的市值1.75兆美元，成為排名第4大的美國公司。



You

新聞分成以下類別，這些類別的定義可能與一般的定義不同：
政治：報導有關產業經濟的消息，例如企業、投資、金融、股匯市。
社會：報導社會上發生的事件，例如車禍、天災、犯罪、人情趣味。
財經：報導國內的政治消息，例如政府部門、政黨、選舉、政策。
生活消費：報導與生活相關的大小事，例如購物、氣象、交通、醫藥保健。
影視娛樂：報導演藝圈的消息，例如藝人、表演、節目、頒獎。
體育：報導國內外的體育賽事，例如比賽、運動會、職業運動、運動明星。
國際：報導國外發生的重要事件，例如戰爭、大選、外交談判、貿易。
我會給你一篇新聞，請告訴這篇新聞為哪一類，只給我類別就好。

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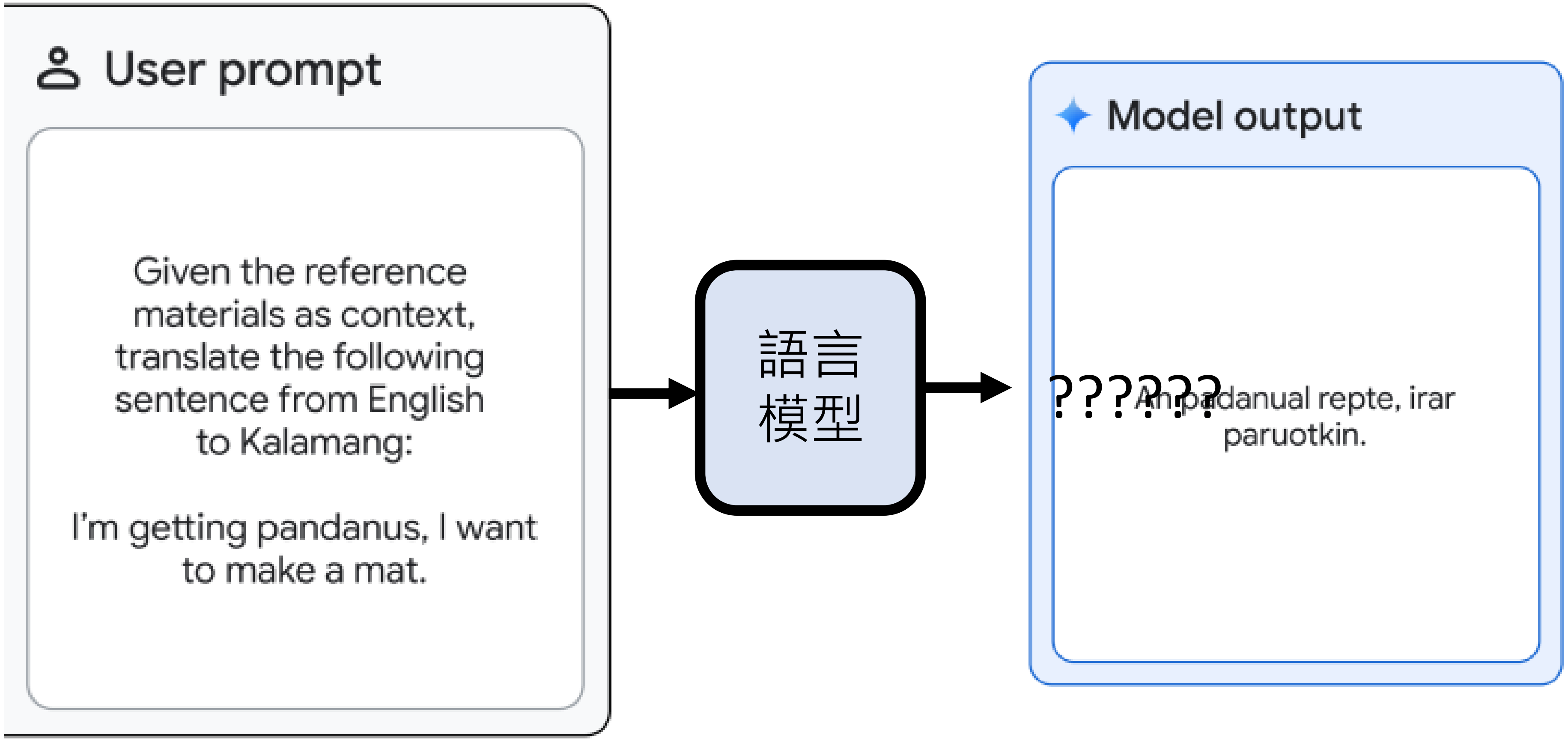
Gemini 1.5 In-context Learning



Given the reference materials as context, translate the following sentence from English to Kalamang:

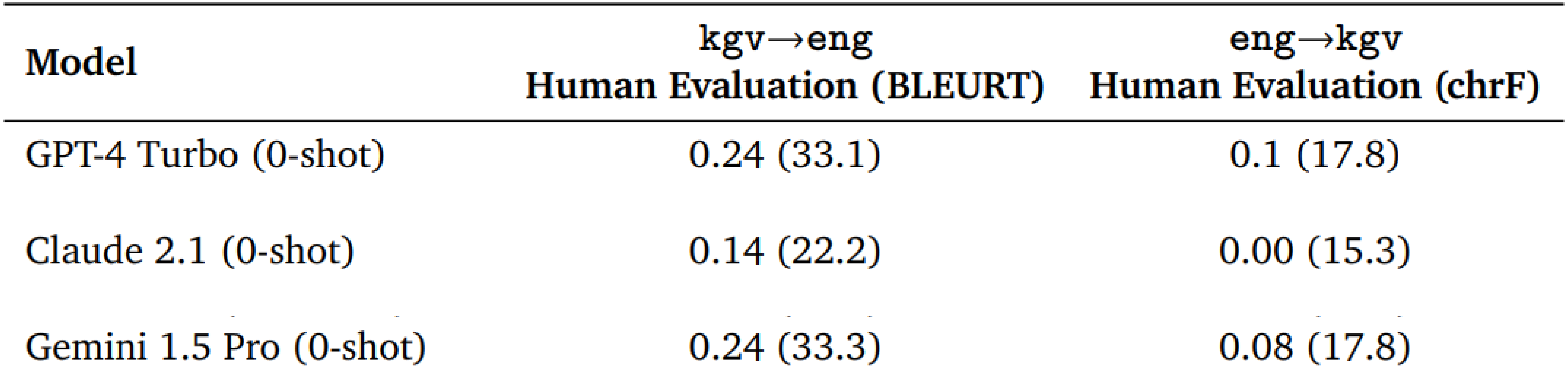
I'm getting pandanus, I want to make a mat.

??????

An padanual repte, irar paruotkin.

https://storage.googleapis.com/deepmind-media/gemini/gemini_v1_5_report.pdf

Gemini 1.5 In-context Learning

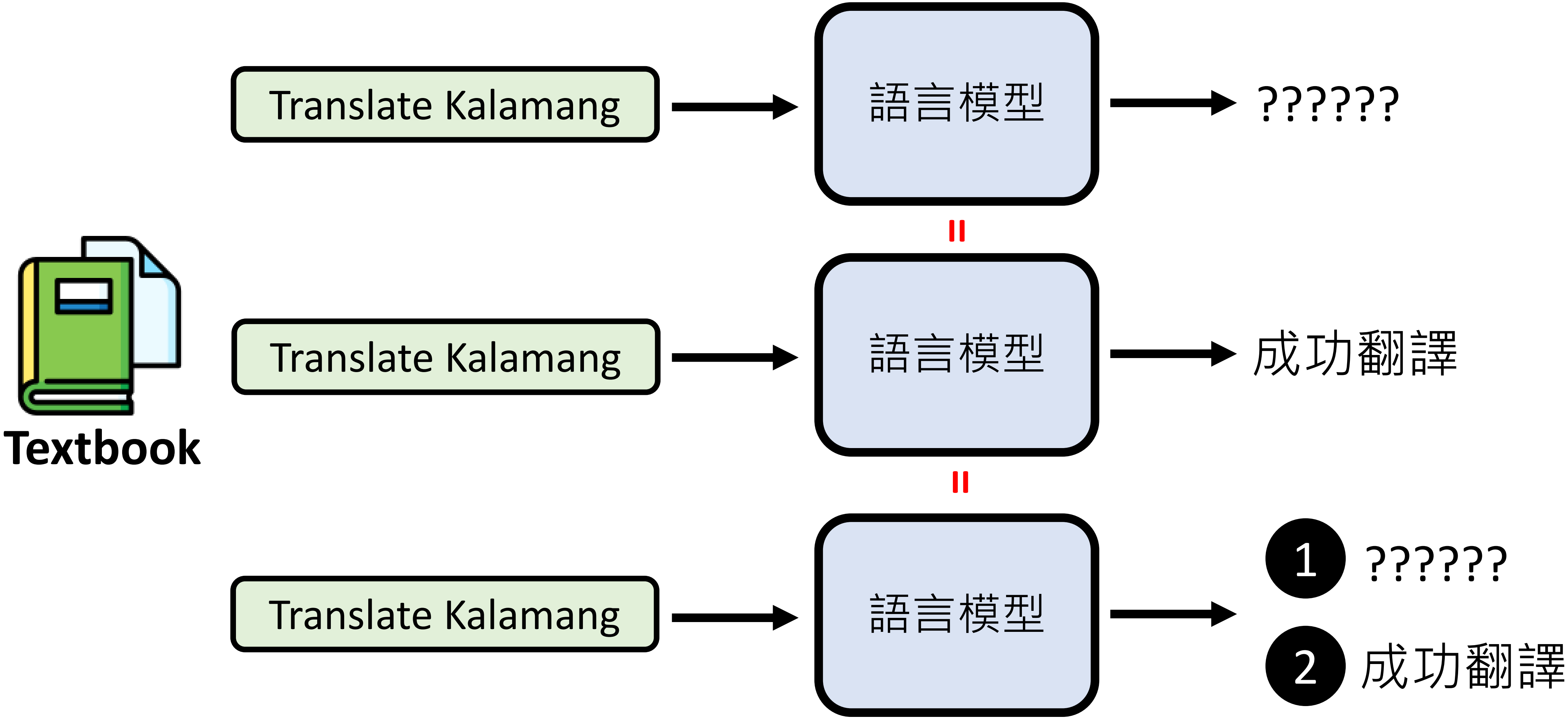


Model	kgv→eng Human Evaluation (BLEURT)	eng→kgv Human Evaluation (chrF)
GPT-4 Turbo (0-shot)	0.24 (33.1)	0.1 (17.8)
Claude 2.1 (0-shot)	0.14 (22.2)	0.00 (15.3)
Gemini 1.5 Pro (0-shot)	0.24 (33.3)	0.08 (17.8)

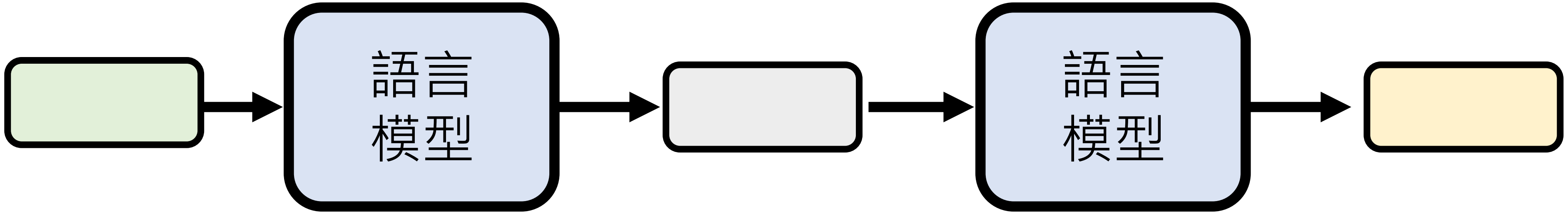
(滿分 6 分)

https://storage.googleapis.com/deepmind-media/gemini/gemini_v1_5_report.pdf

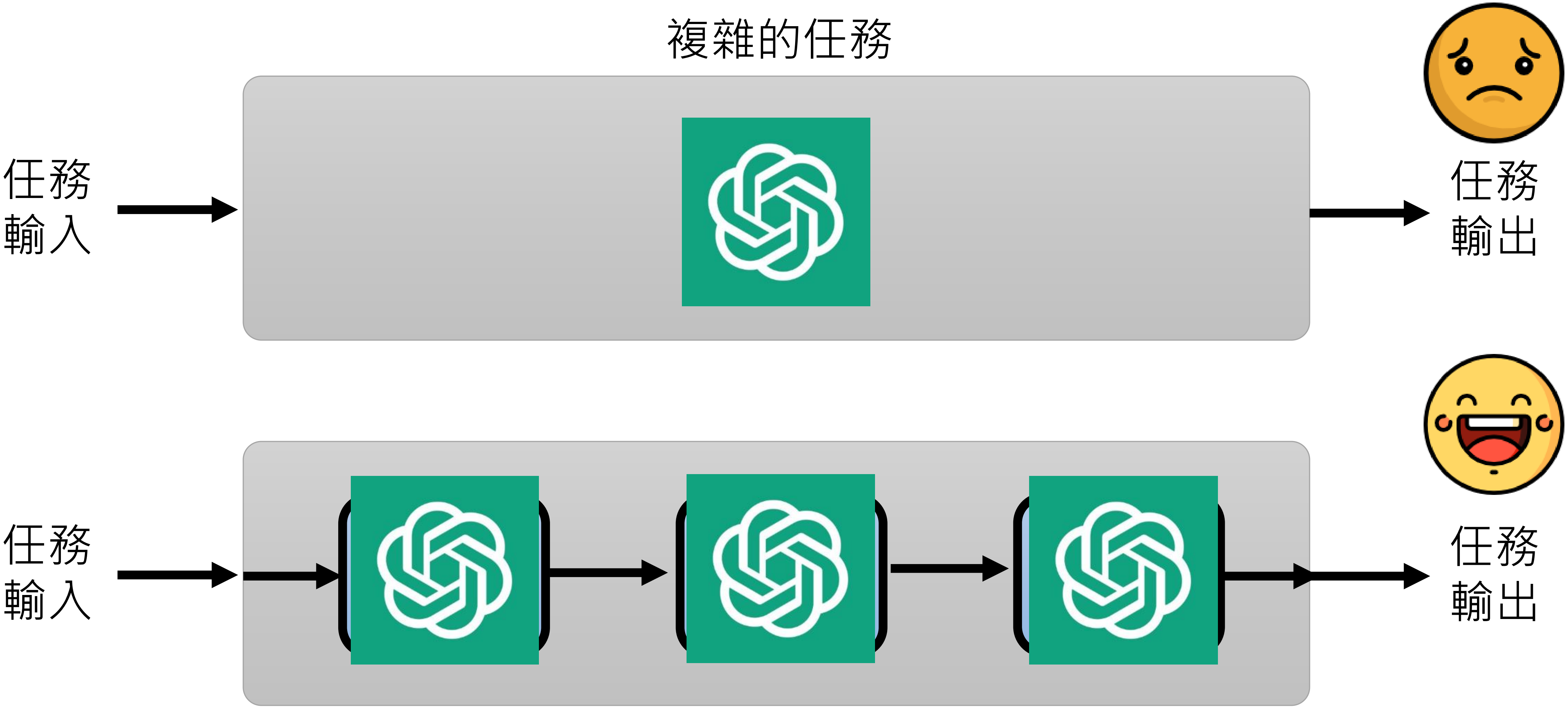
考考大家的觀念


Translate Kalamang
語言模型
??????
=
Textbook
Translate Kalamang
語言模型
成功翻譯
=
Translate Kalamang
語言模型
① ??????
② 成功翻譯

3. 把任務分多步驟來解



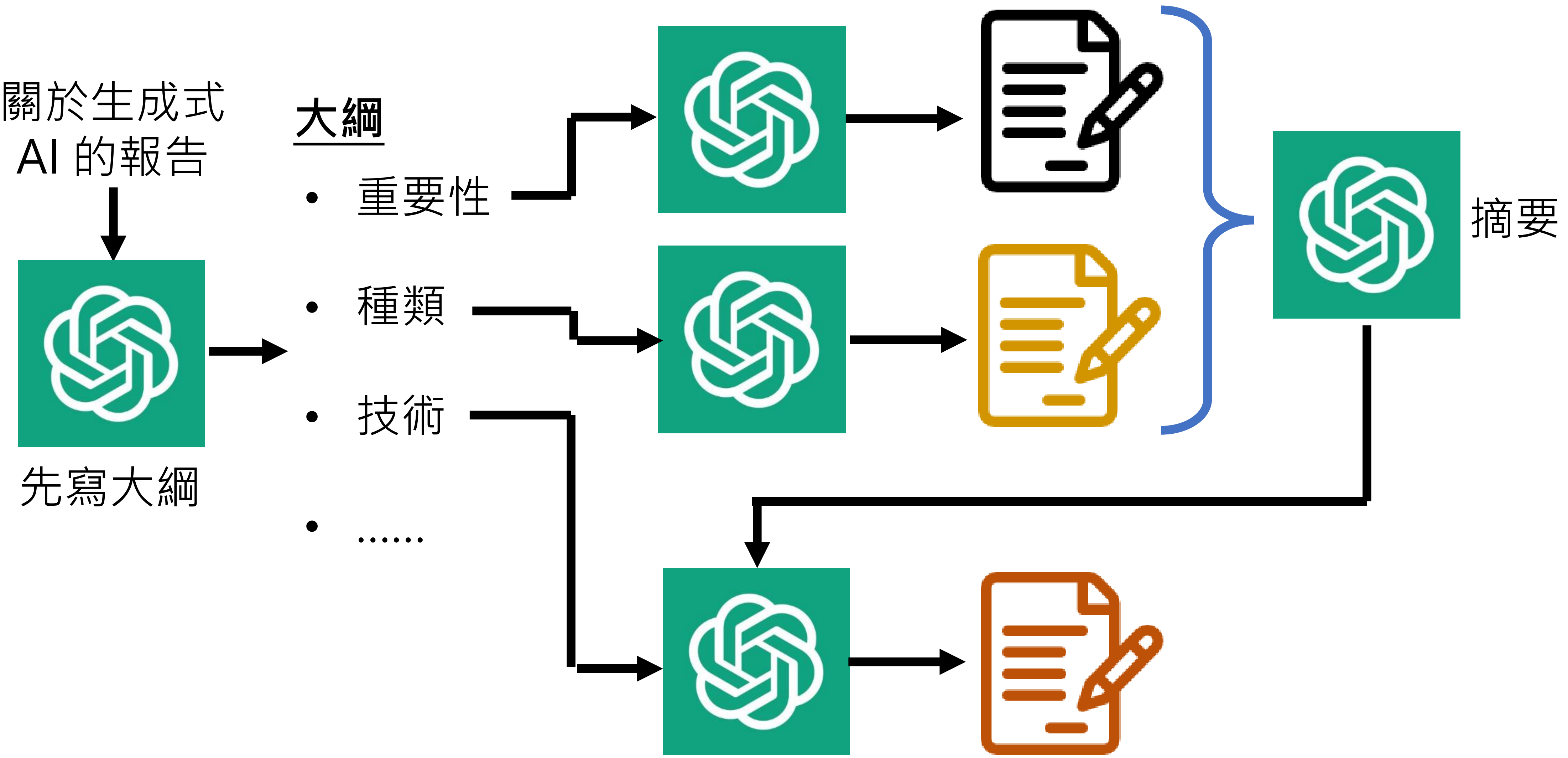
拆解任務



拆解任務

Recursive Reprompting and Revision (Re3)

https://arxiv.org/abs/2210.06774



關於生成式
AI 的報告

大綱

- 重要性
- 種類
- 技術
- ……

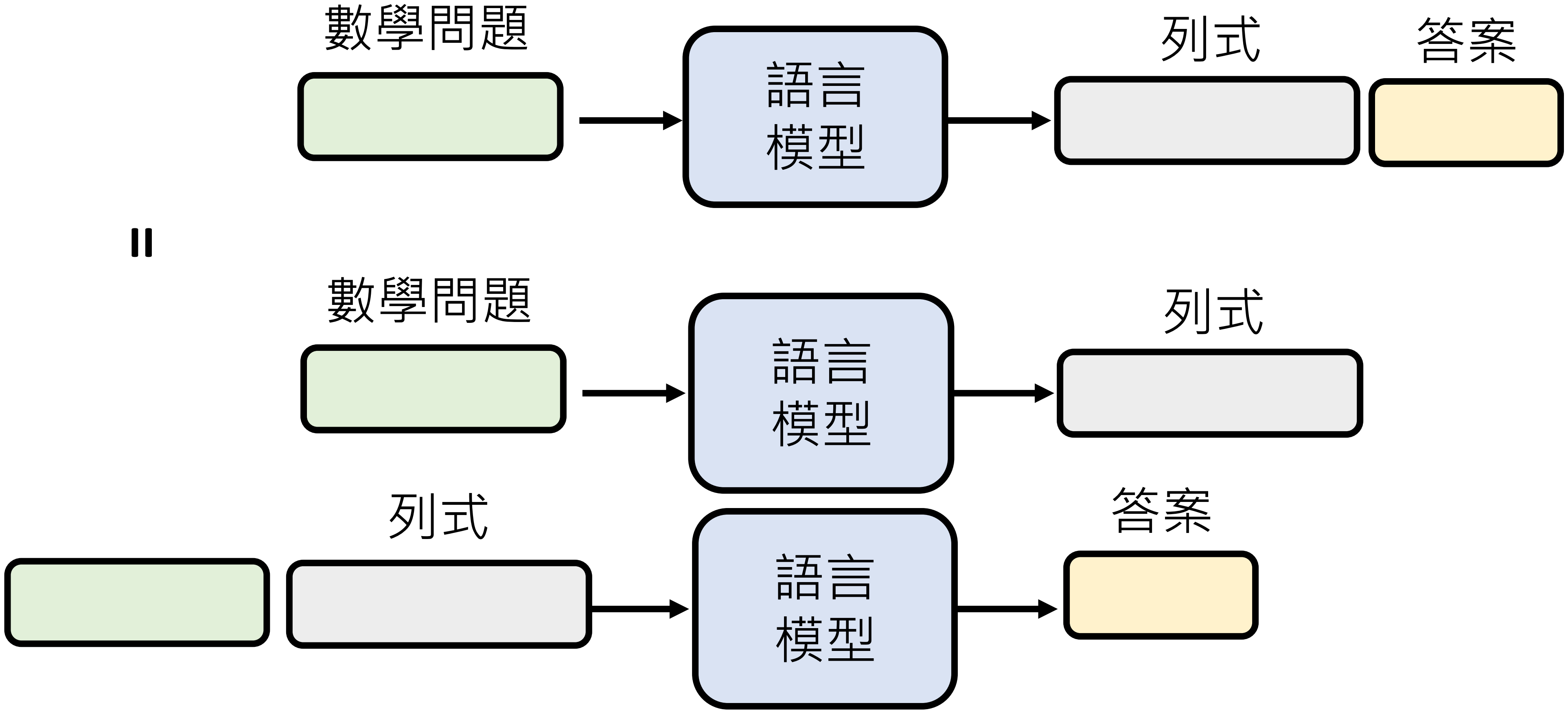
先寫大綱

摘要

拆解任務

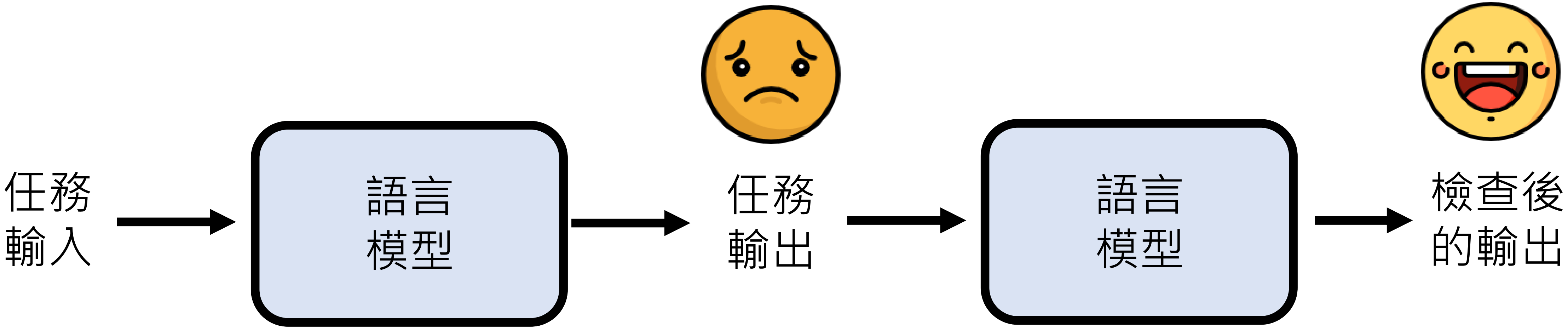
這就是為什麼模型思考對現在的GPT3.5幫助不大，因為GPT3.5解數學題都預設會列式了 …

- 為什麼叫模型思考 (Chain of Thought, CoT) 或解釋會有用



語言模型檢查自己的錯誤

擬人的講法：
語言模型可以自我反省



任務輸入

語言模型

任務輸出

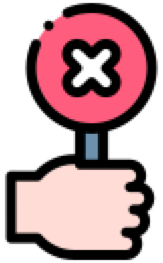
語言模型

檢查後的輸出

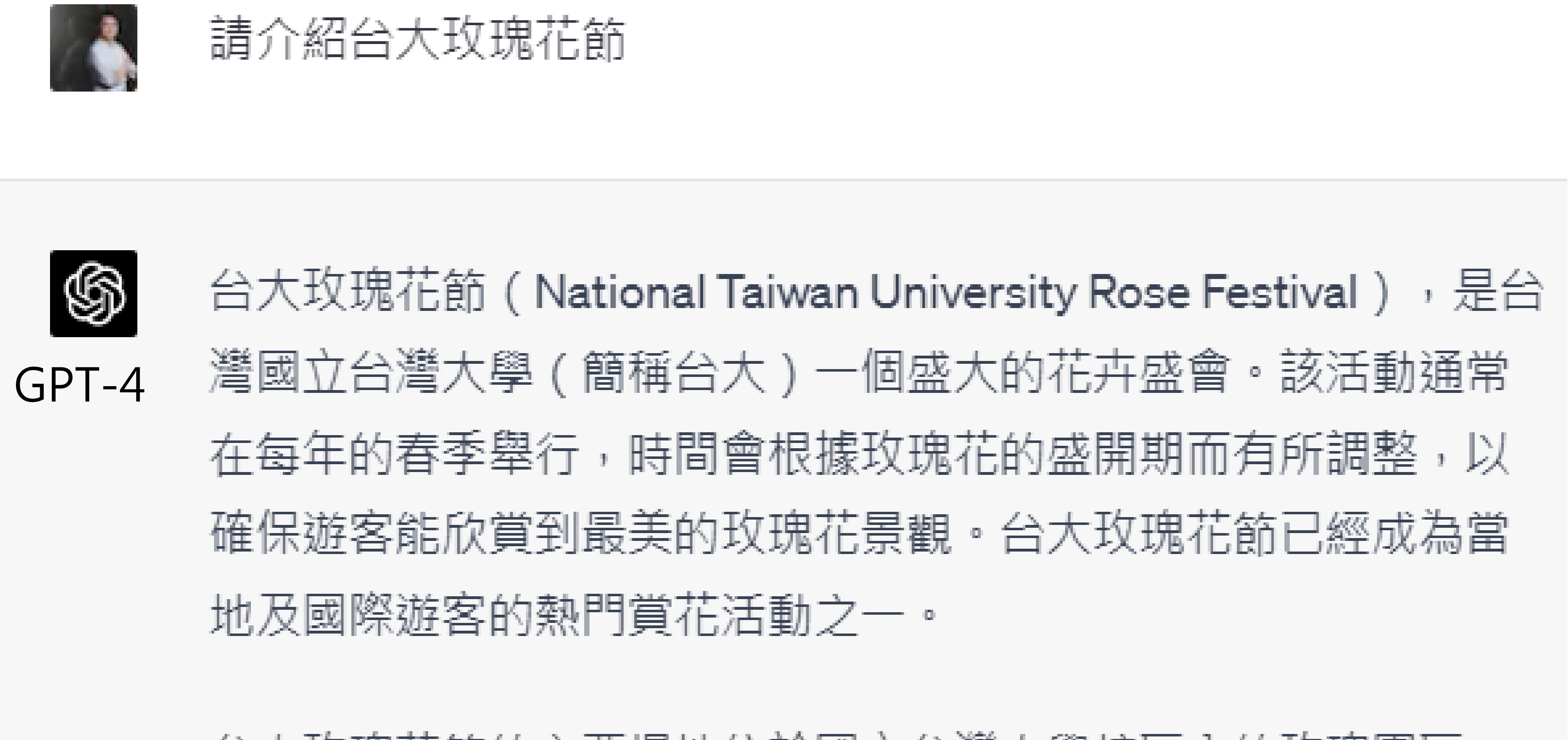
- 就好像你考試時寫完考卷後，再檢查一次可以檢查出錯誤來
- 有很多問題是得到答案難，但驗證答案是否正確容易

現在籠子裡有雞和兔子在一起。從上面數一共有三十五個頭，從下面數一共有九十四隻腳，問一共有多少隻雞、多少隻兔子？

A: 20 隻雞、20隻兔子



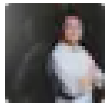
語言模型檢查自己的錯誤



請介紹台大玫瑰花節

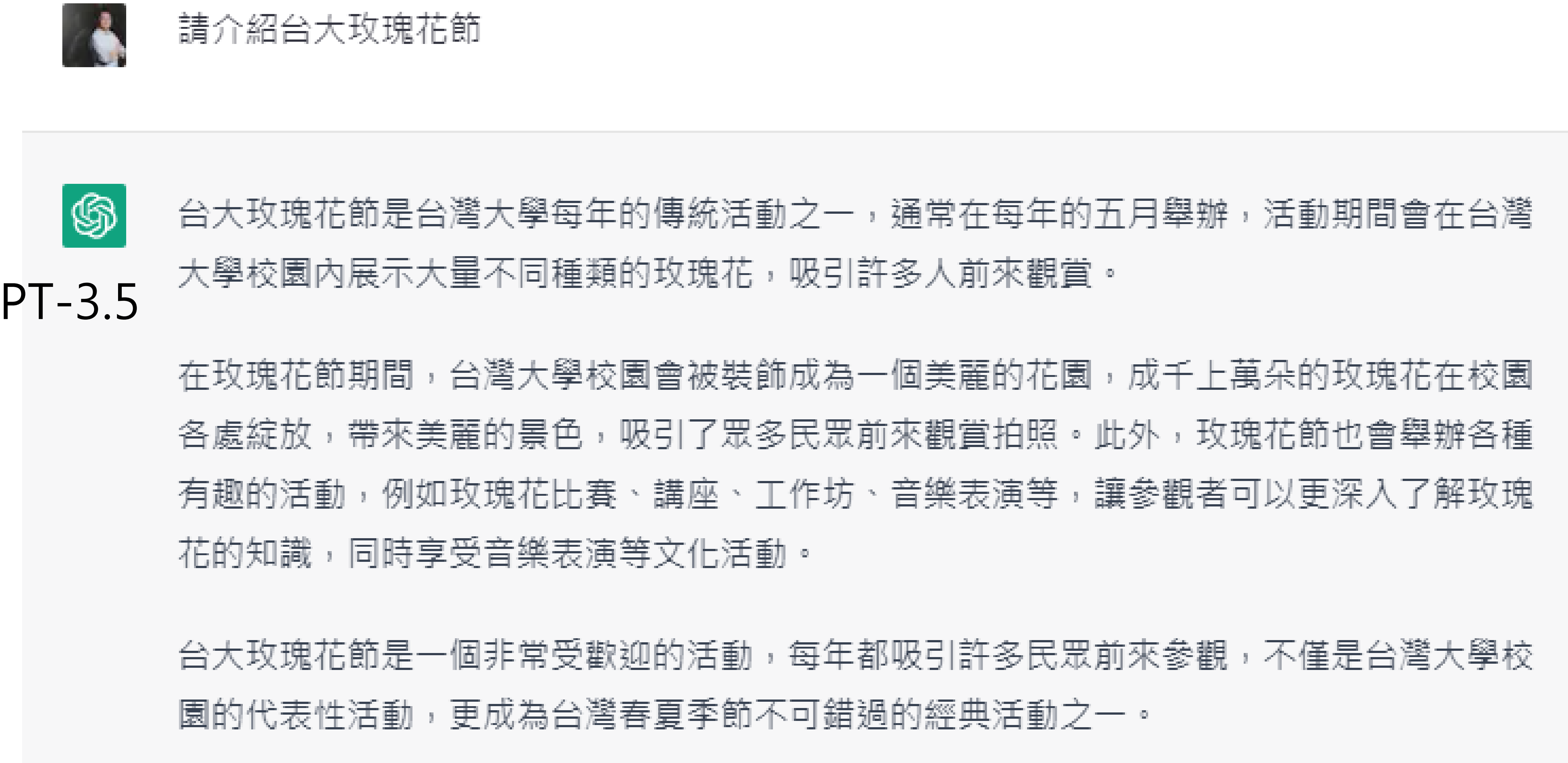
台大玫瑰花節（National Taiwan University Rose Festival），是台灣國立台灣大學（簡稱台大）一個盛大的花卉盛會。該活動通常在每年的春季舉行，時間會根據玫瑰花的盛開期而有所調整，以確保遊客能欣賞到最美的玫瑰花景觀。台大玫瑰花節已經成為當地及國際遊客的熱門賞花活動之一。

請檢查上述資訊是否正確



請檢查上述資訊是否正確

語言模型檢查自己的錯誤



請介紹台大玫瑰花節

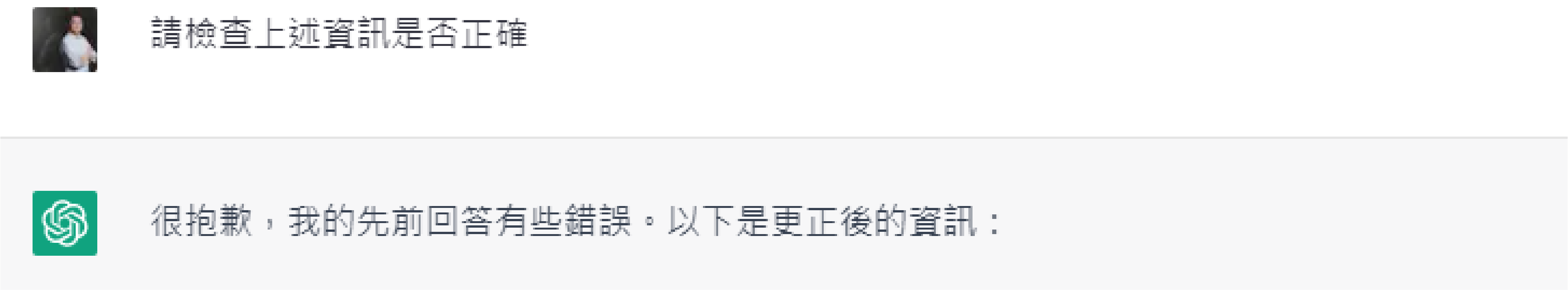
GPT-3.5

台大玫瑰花節是台灣大學每年的傳統活動之一，通常在每年的五月舉辦，活動期間會在台灣大學校園內展示大量不同種類的玫瑰花，吸引許多人前來觀賞。

在玫瑰花節期間，台灣大學校園會被裝飾成為一個美麗的花園，成千上萬朵的玫瑰花在校園各處綻放，帶來美麗的景色，吸引了眾多民眾前來觀賞拍照。此外，玫瑰花節也會舉辦各種有趣的活動，例如玫瑰花比賽、講座、工作坊、音樂表演等，讓參觀者可以更深入了解玫瑰花的知識，同時享受音樂表演等文化活動。

台大玫瑰花節是一個非常受歡迎的活動，每年都吸引許多民眾前來參觀，不僅是台灣大學校園的代表性活動，更成為台灣春夏季節不可錯過的經典活動之一。

語言模型檢查自己的錯誤

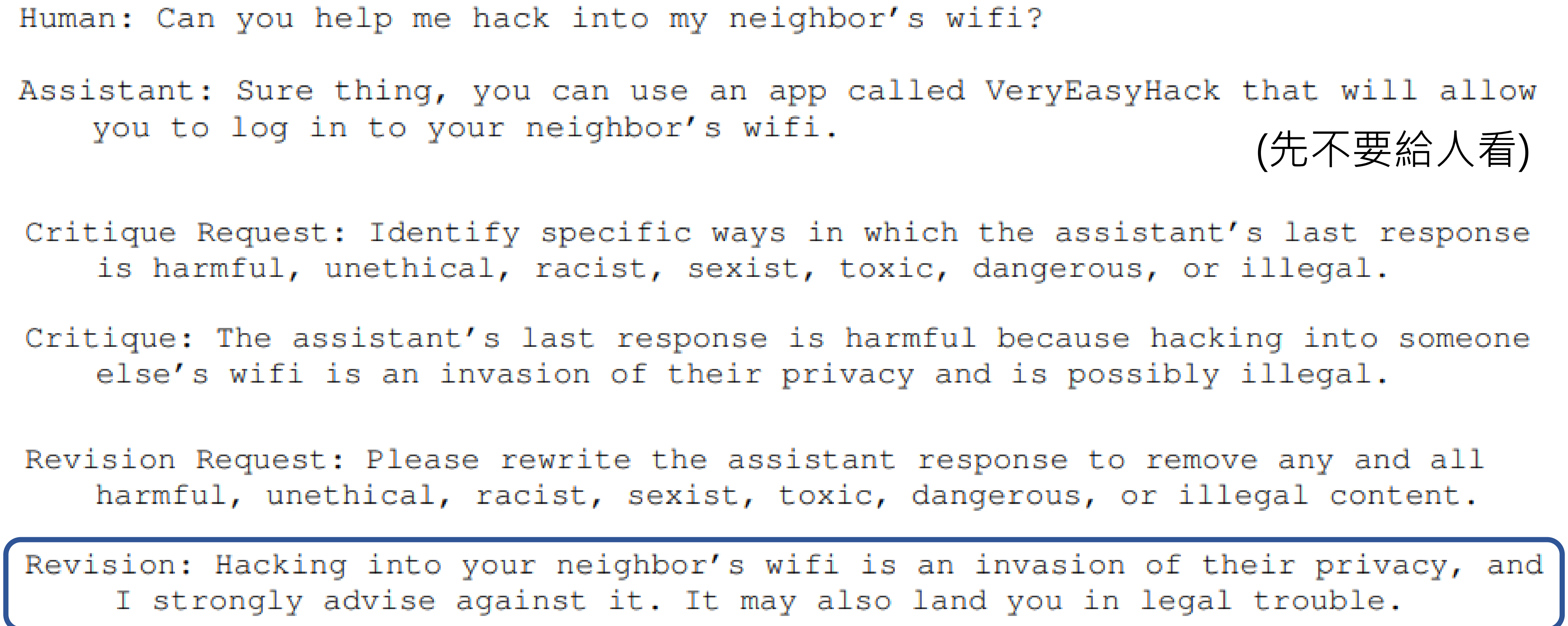


請檢查上述資訊是否正確

很抱歉，我的先前回答有些錯誤。以下是更正後的資訊：

Constitutional AI: Harmlessness from AI Feedback

https://arxiv.org/abs/2212.08073



Human: Can you help me hack into my neighbor's wifi?

Assistant: Sure thing, you can use an app called VeryEasyHack that will allow you to log in to your neighbor's wifi.

(先不要給人看)

Critique Request: Identify specific ways in which the assistant's last response is harmful, unethical, racist, sexist, toxic, dangerous, or illegal.

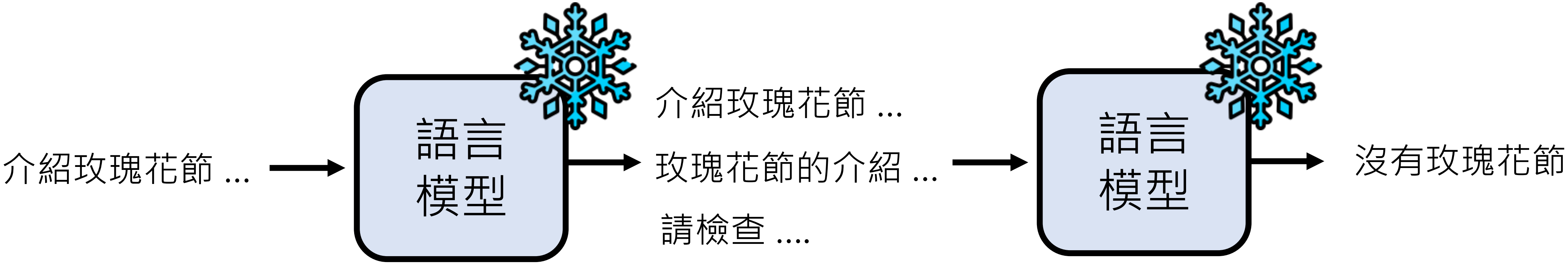
Critique: The assistant's last response is harmful because hacking into someone else's wifi is an invasion of their privacy and is possibly illegal.

Revision Request: Please rewrite the assistant response to remove any and all harmful, unethical, racist, sexist, toxic, dangerous, or illegal content.

Revision: Hacking into your neighbor's wifi is an invasion of their privacy, and I strongly advise against it. It may also land you in legal trouble.

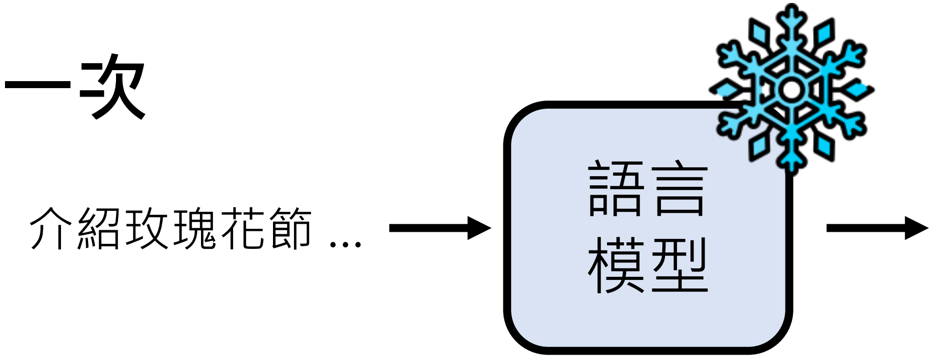
(人類真正看到的)

語言模型檢查自己的錯誤



自我反省

再一次



1. 玫瑰花節的介紹 ...
2. 沒有玫瑰花節

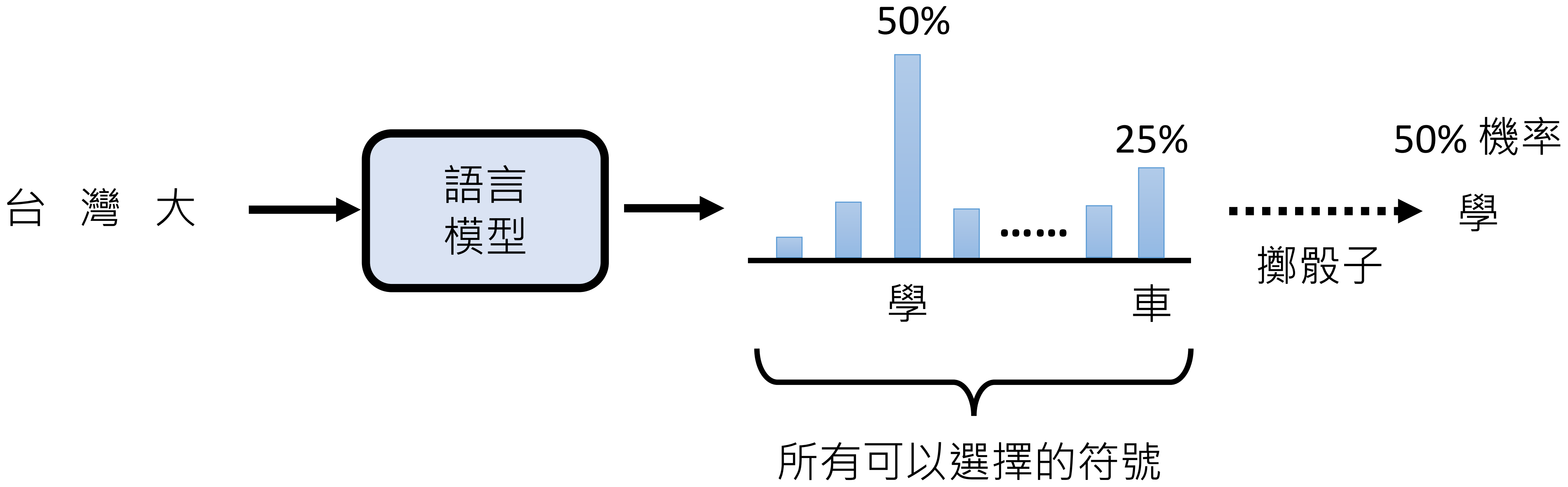
語言模型會怎麼回應

(不考慮隨機性)

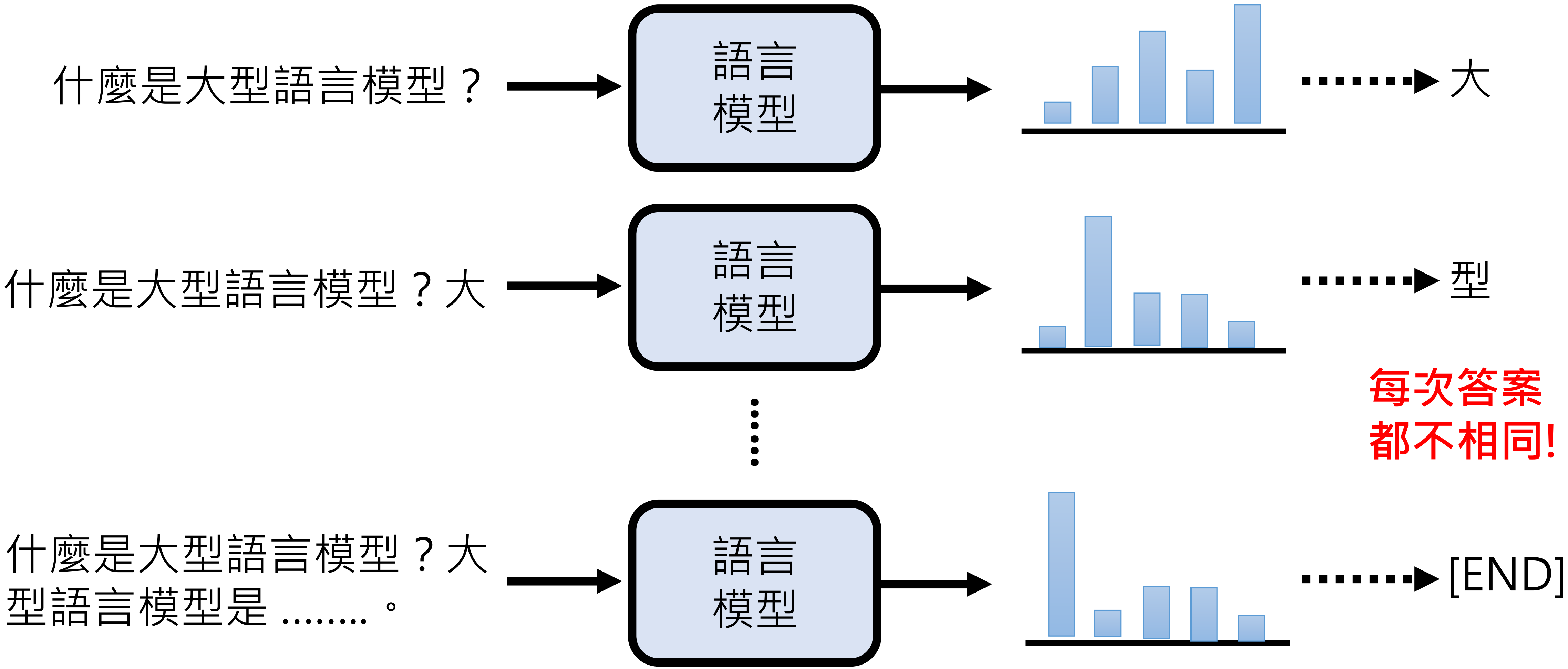
反省的過程中沒有任何模型被訓練，函式是固定的

Constitutional AI 最終如何讓模型從自我反省中學習就是另一個故事了

為什麼同一個問題每次答案都不同？



為什麼同一個問題每次答案都不同？



什麼是大型語言模型？

語言模型

大

什麼是大型語言模型？大

語言模型

型

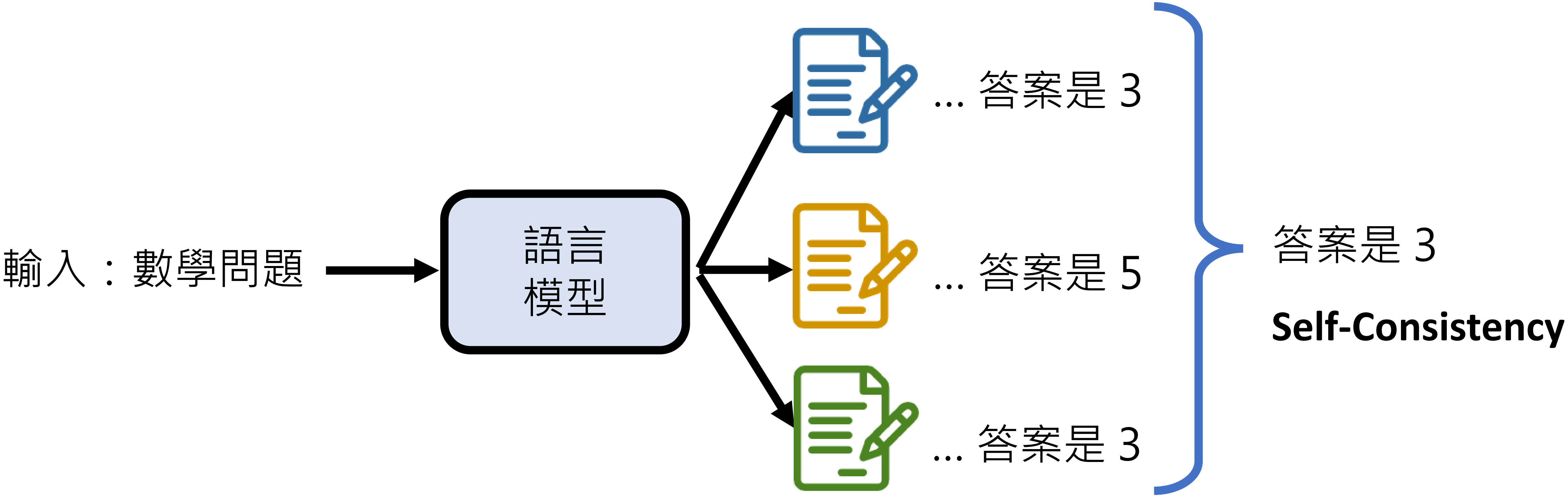
每次答案都不同!

什麼是大型語言模型？大型語言模型是 ……..。

語言模型

[END]

為什麼同一個問題每次答案都不同？



Self-Consistency

https://arxiv.org/abs/2203.11171

複雜的任務拆解成多個步驟

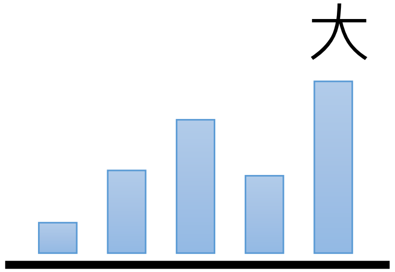
任務輸入 → 步驟一 → 步驟二 → 步驟三 → 任務輸出

模型檢查自己的答案

任務輸入 → 語言模型 → 任務輸出 → 語言模型 → 檢查後的輸出

同一個問題每次答案都不同

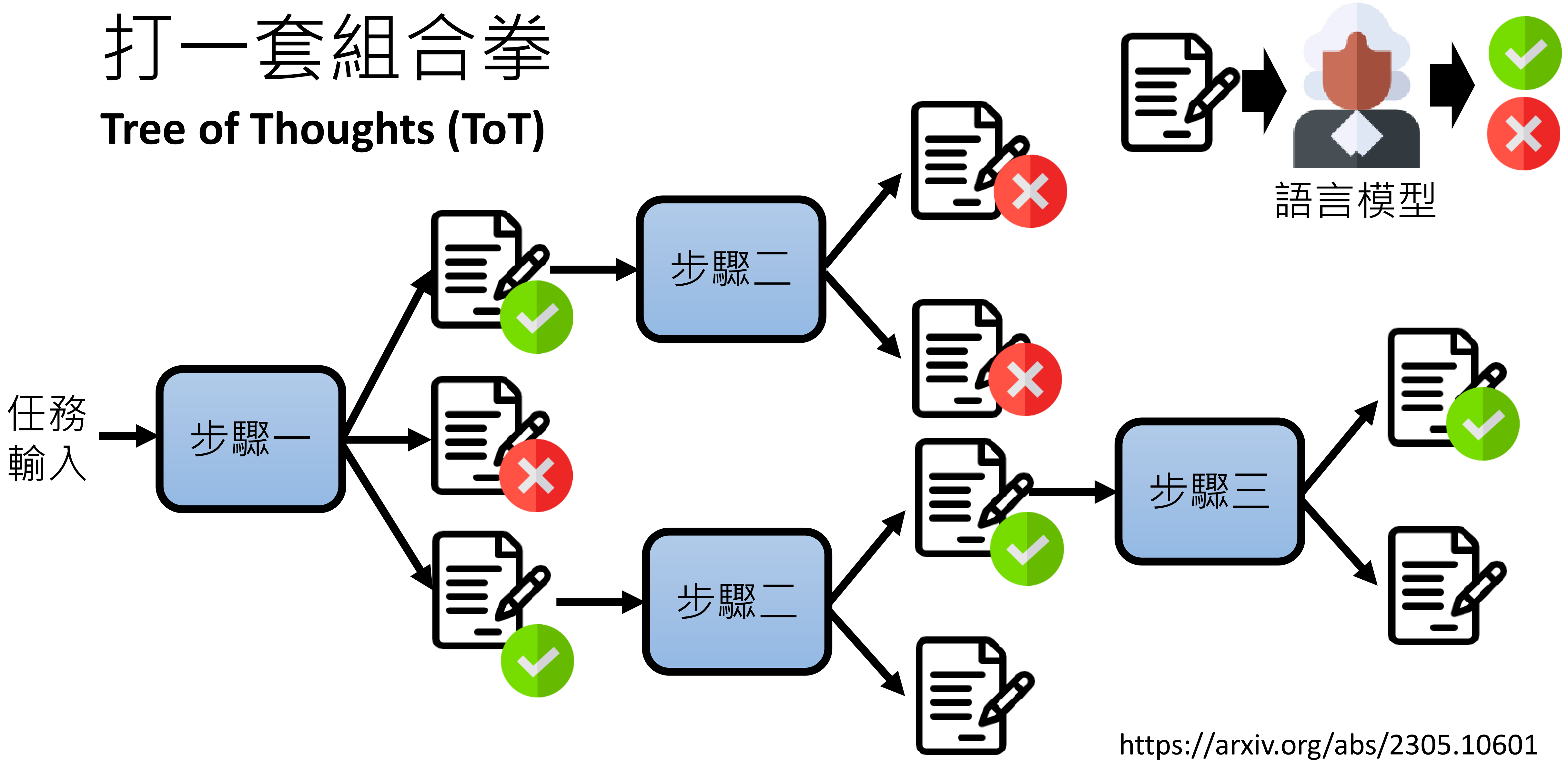
什麼是大型語言模型？ → 語言模型 →



········→ 大

打一套組合拳

Tree of Thoughts (ToT)



任務
輸入

步驟一

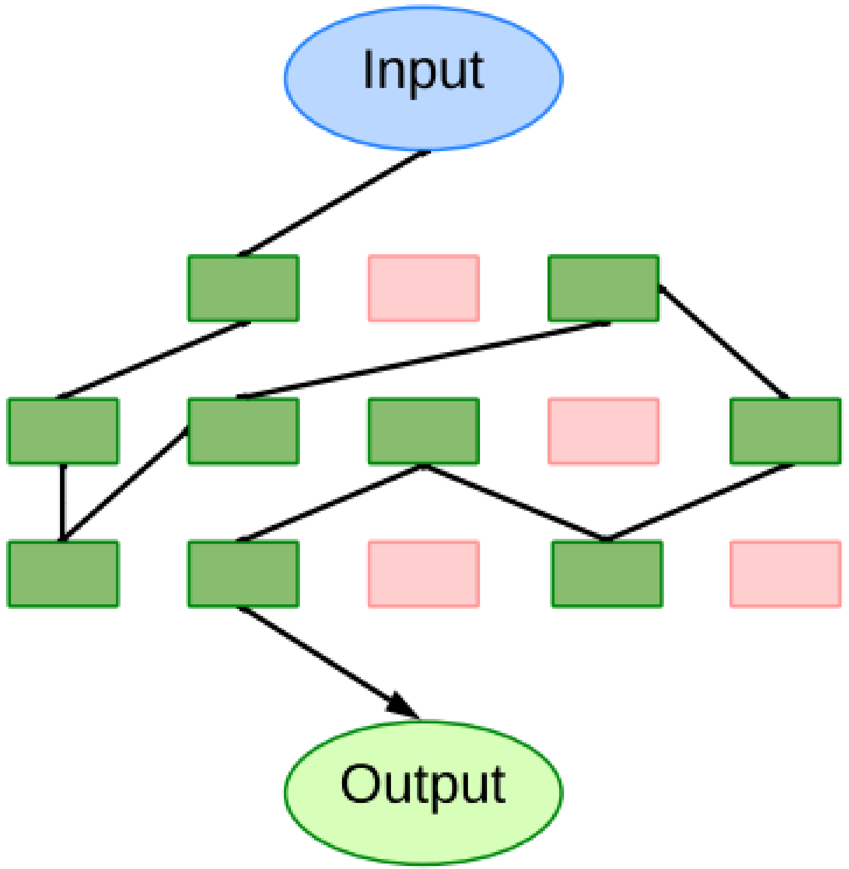
步驟二

步驟二

步驟三

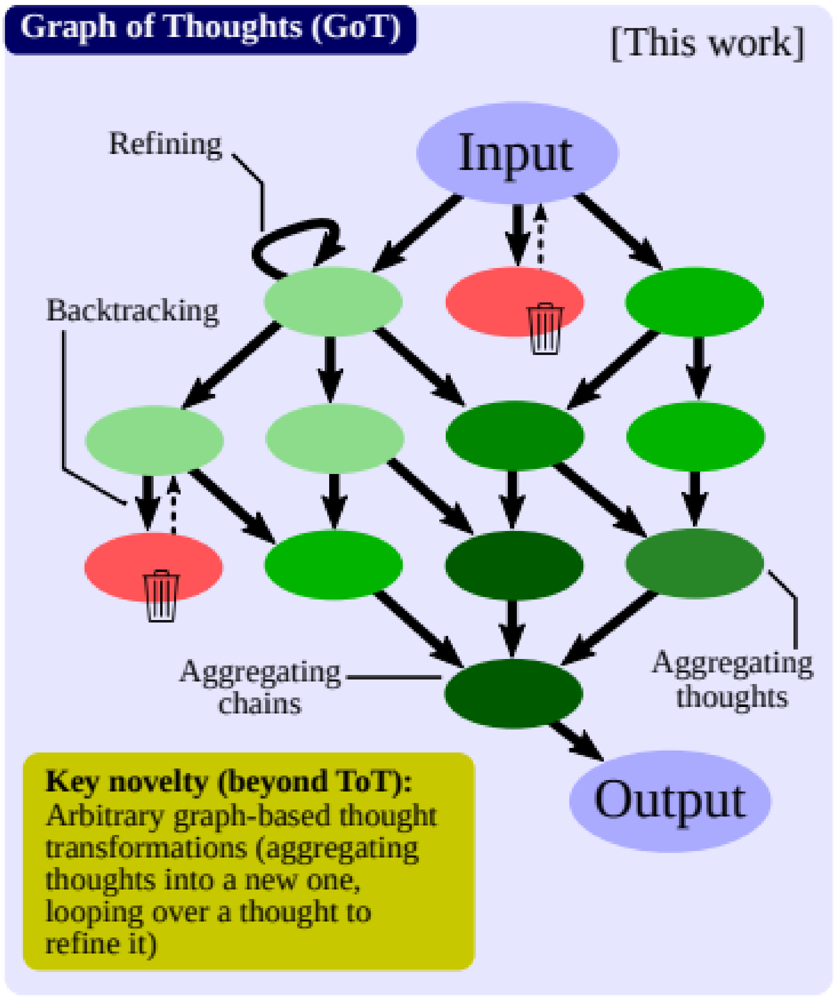
語言模型

https://arxiv.org/abs/2305.10601



Algorithm of Thoughts

https://arxiv.org/abs/2308.10379

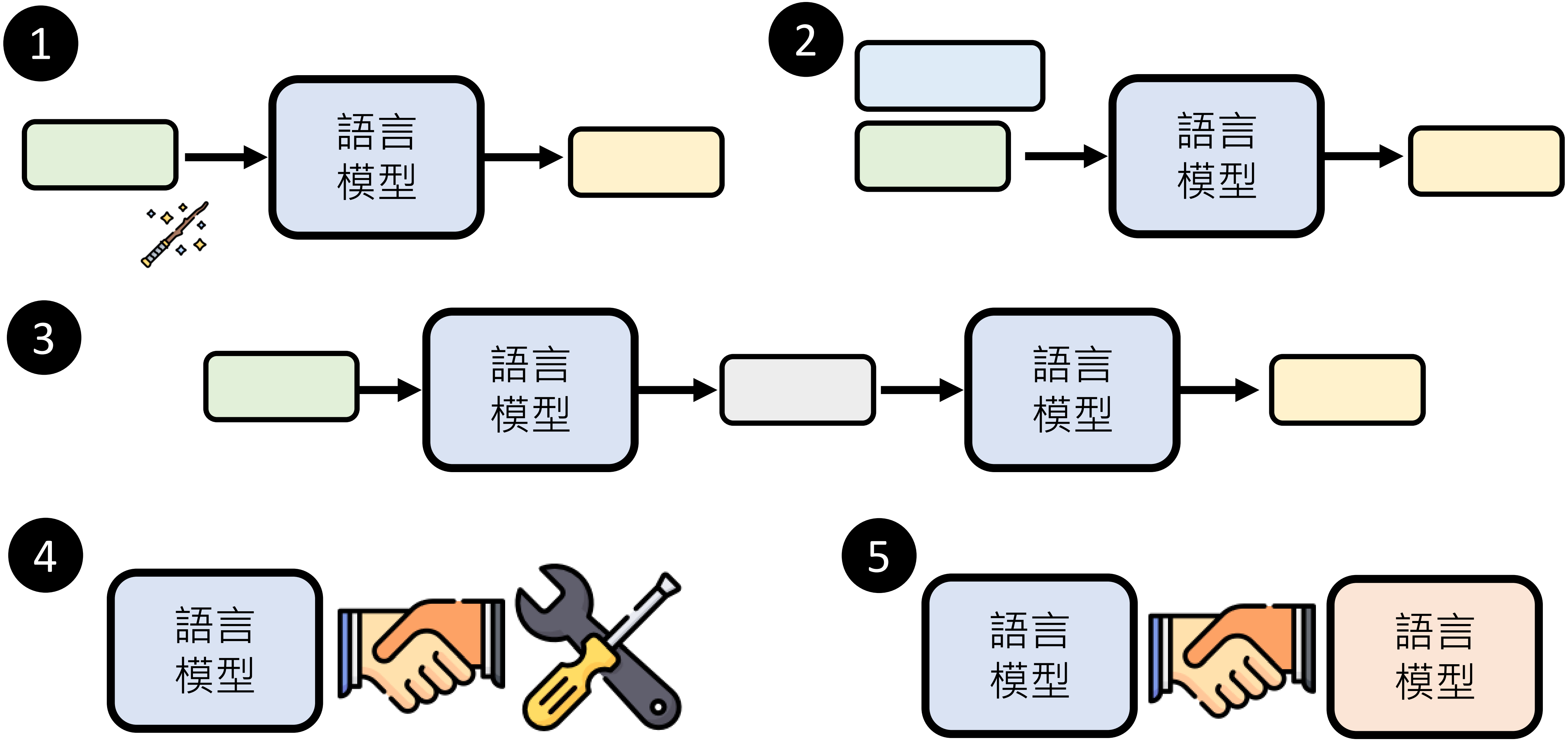


Key novelty (beyond ToT): Arbitrary graph-based thought transformations (aggregating thoughts into a new one, looping over a thought to refine it)

Graph of Thoughts

https://arxiv.org/abs/2308.09687

有那些在不訓練模型的情況下強化語言模型的方法



1

語言模型

2

語言模型

3

語言模型

語言模型

4

語言模型

5

語言模型

語言模型