# 對於人工智慧的兩種不同期待

## Finetune vs. Prompt

# 如何使用大型語言模型


“A mouse riding on the head of an elephant, using reins to steer the giant creature.” (powered by Midjourney )

# 語言模型

**GPT**

**文字接龍**

how are ____

**BERT**

**文字填空**

how are you

# 對於人工智慧的兩種不同期待

- 期待一：成為專才

這堂課我們要講如何駕馭大型語言模型 ……

翻譯

This course is about ……

這堂課我們要講如何駕馭大型語言模型 ……

摘要

本課程重點為 ……

# 對於人工智慧的兩種不同期待

- 期待二：成為通才

這就是今日 ChatGPT 走的路線

Prompt

對以下文句做**翻譯**：

這堂課我們要講如何駕馭大型語言模型 ……

什麼都會

This course is about ……

對以下文句做**摘要**：

這堂課我們要講如何駕馭大型語言模型 ……

什麼都會

本課程重點為 ……

# 對於人工智慧的兩種不同期待

- 期待二：成為通才

The Natural Language Decathlon: Multitask Learning as Question Answering

https://arxiv.org/abs/1806.08730

| Question | Context | Answer |
|---|---|---|
| What is a major importance of Southern California in relation to California and the US? | ...Southern California is a major economic center for the state of California and the US.... | major economic center |
| What is the translation from English to German? | Most of the planet is ocean water. | Der Großteil der Erde ist Meerwasser |
| What is the summary? | Harry Potter star Daniel Radcliffe gains access to a reported £320 million fortune... | Harry Potter star Daniel Radcliffe gets £320M fortune... |
| Hypothesis: Product and geography are what make cream skimming work. Entailment, neutral, or contradiction? | Premise: Conceptually cream skimming has two basic dimensions – product and geography. | Entailment |
| Is this sentence positive or negative? | A stirring, funny and finally transporting re-imagining of Beauty and the Beast and 1930s horror film. | positive |

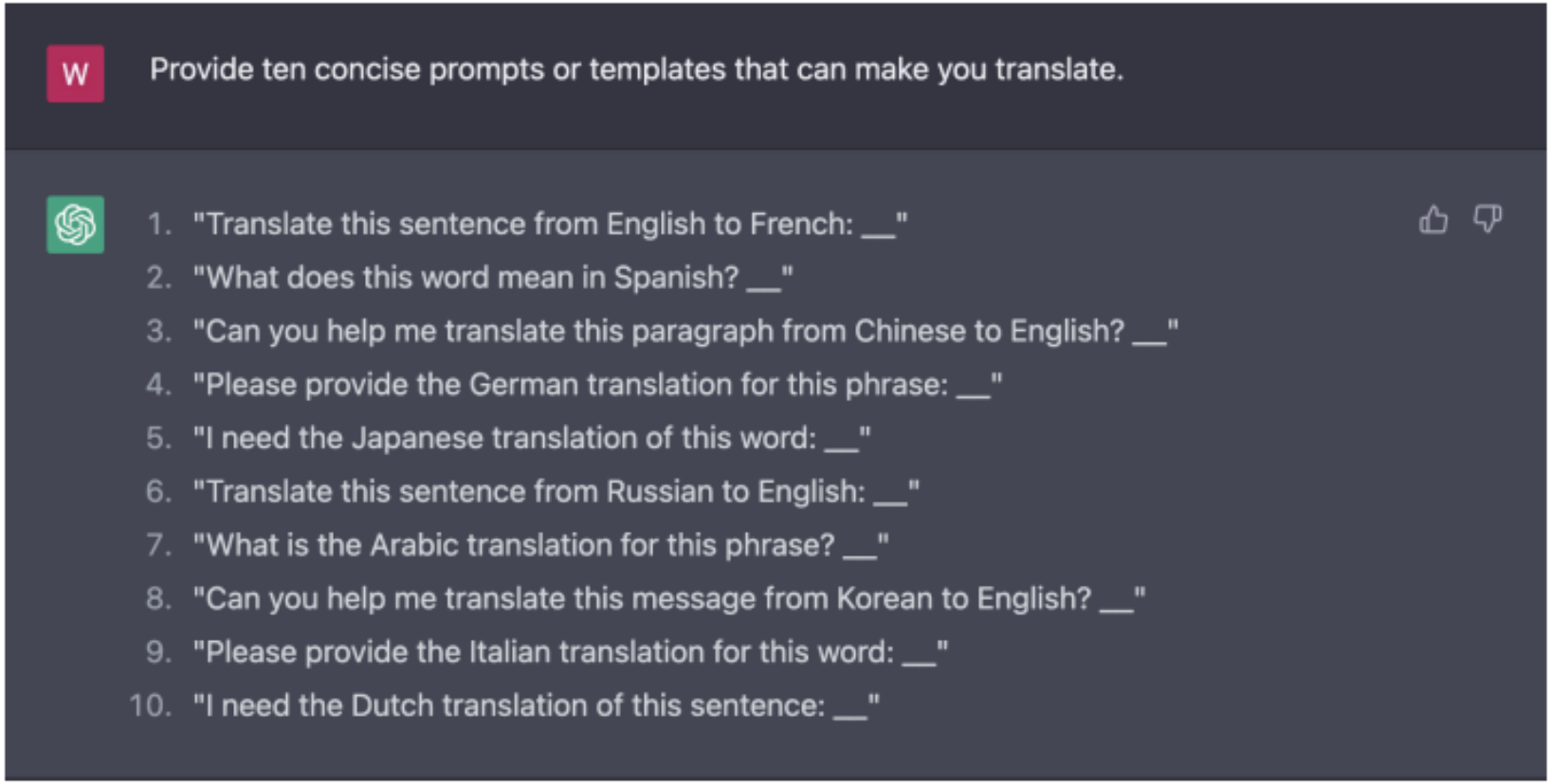
| Question | Context | Answer |
|---|---|---|
| What has something experienced? | Areas of the Baltic that have experienced eutrophication. | eutrophication |
| Who is the illustrator of Cycle of the Werewolf? | Cycle of the Werewolf is a short novel by Stephen King, featuring illustrations by comic book artist Bernie Wrightson. | Bernie Wrightson |
| What is the change in dialogue state? | Are there any Eritrean restaurants in town? | food: Eritrean |
| What is the translation from English to SQL? | The table has column names... Tell me what the notes are for South Australia | SELECT notes from table WHERE 'Current Slogan' = 'South Australia' |
| Who had given help? Susan or Joan? | Joan made sure to thank Susan for all the help she had given. | Susan |

Ask Me Anything: Dynamic Memory Networks for Natural Language Processing

https://arxiv.org/abs/1506.07285

# 對於人工智慧的兩種不同期待

- 成為專才的好處：專才在單一任務上有機會贏過通才




Is ChatGPT A Good Translator? A Preliminary Study

https://arxiv.org/abs/2301.08745

# 對於人工智慧的兩種不同期待

- 成為專才的好處：專才在單一任務上有機會贏過通才

| System | De-En | | Ro-En | | Zh-En | |
|---|---|---|---|---|---|---|
| | ⇒ | ⇐ | ⇒ | ⇐ | ⇒ | ⇐ |
| Google | 45.04 | 41.16 | 50.12 | 46.03 | 31.66 | 43.58 |
| DeepL | 49.23 (+9.3%) | 41.46 (+0.7%) | 50.61 (+0.9%) | 48.39 (+5.1%) | 31.22 (-1.3%) | 44.31 (+1.6%) |
| Tencent | n/a | n/a | n/a | n/a | 29.69 (-6.2%) | 46.06 (+5.6%) |
| ChatGPT | 43.71 (-2.9%) | 38.87 (-5.5%) | 44.95 (-10.3%) | 24.85 (-46.0%) | 24.73 (-21.8%) | 38.27 (-12.1%) |

| System | De-Zh | | Ro-Zh | | De-Ro | |
|---|---|---|---|---|---|---|
| | ⇒ | ⇐ | ⇒ | ⇐ | ⇒ | ⇐ |
| Google | 38.71 | 21.68 | 39.05 | 25.59 | 33.31 | 32.27 |
| DeepL | 40.46 (+4.5%) | 22.82 (+5.2%) | 38.95 (-0.2%) | 25.39 (-0.7%) | 35.19 (+5.6%) | 34.27 (+6.1%) |
| Tencent | 40.66 (+5.0%) | 19.44 (-10.3%) | n/a | n/a | n/a | n/a |
| ChatGPT | 34.46 (-10.9%) | 19.80 (-8.6%) | 30.84 (-21.0%) | 19.17 (-25.0%) | 33.38 (+0.2%) | 29.89 (-7.3%) |

Is ChatGPT A Good Translator? A Preliminary Study

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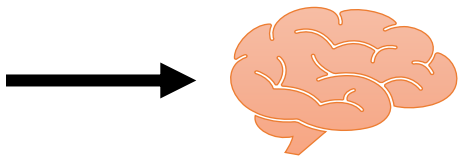
# 對於人工智慧的兩種不同期待

- 成為通才的好處：只要重新設計 prompt 就可以快速開發新功能，不用寫程式

對以下文句做**摘要**：

這堂課我們要講如何駕馭大型語言模型 .....

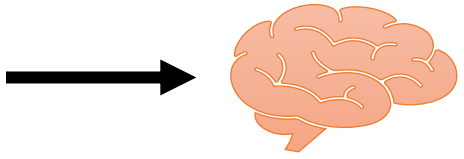


什麼都會

本課程重點為 .....


請給我 **100 字**以內的**摘要**：

這堂課我們要講如何駕馭大型語言模型 .....



什麼都會

重點是 .....

# 兩種不同期待導致兩類不同的使用方式

- 期待一：成為專才

這堂課我們要講如何駕馭大型語言模型 ……



翻譯

This course is about ……

- 期待二：成為通才

對以下文句做**翻譯**：

這堂課我們要講如何駕馭大型語言模型 ……

什麼都會

This course is about ……

# 對預訓練模型做改造

**BERT**

**文字填空**

how are you

語言模型

**改造**

加外掛和微調參數

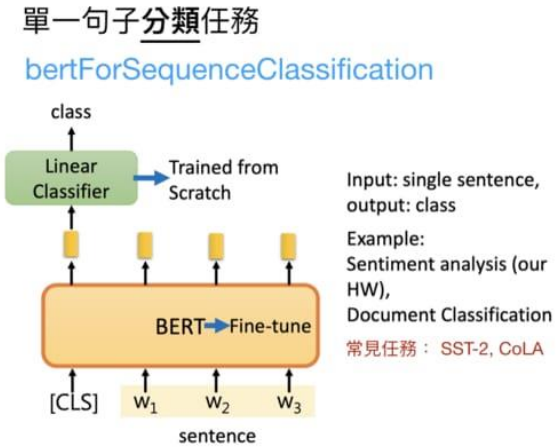


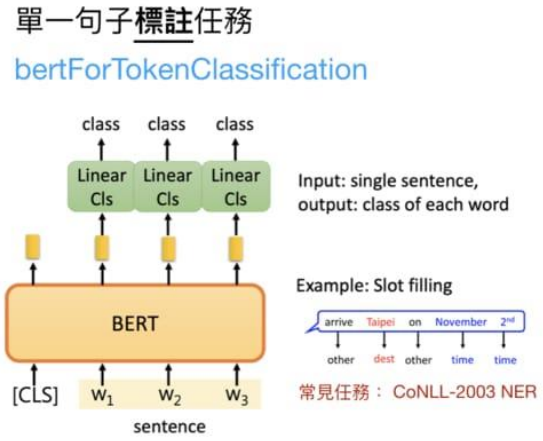
翻譯專才

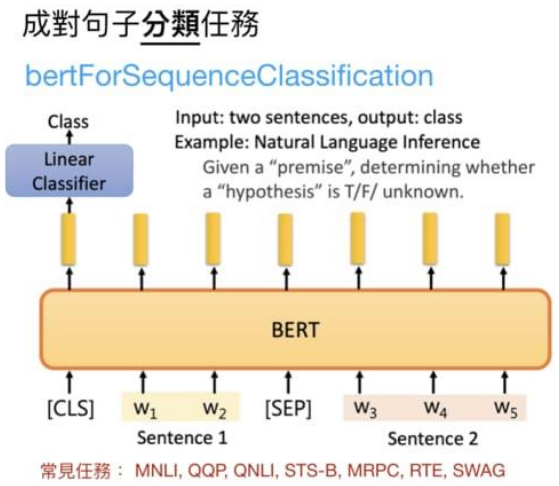
摘要專才

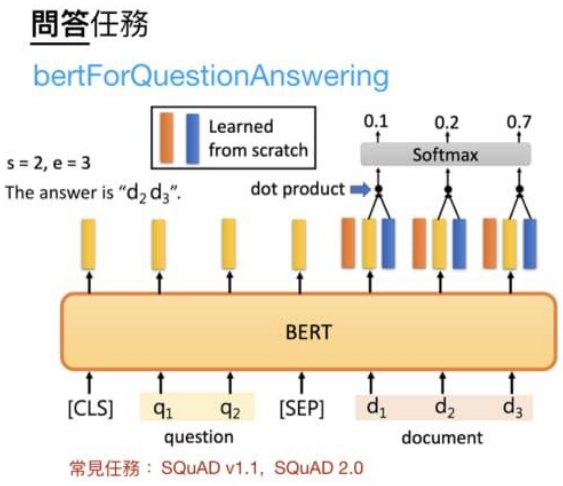
編修專才

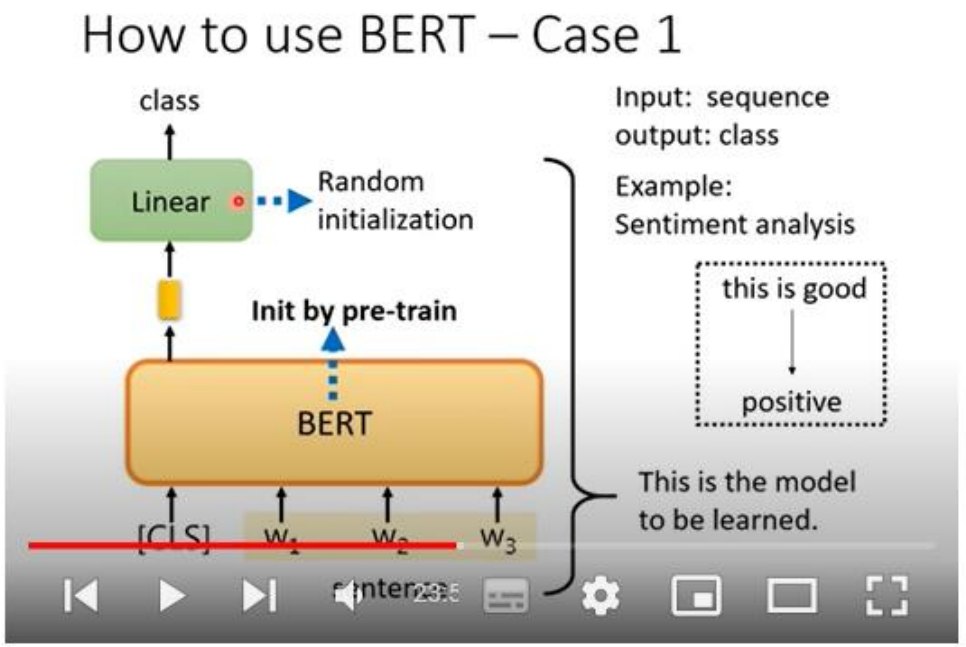
# 對預訓練模型做改造 — 加外掛 (Head)



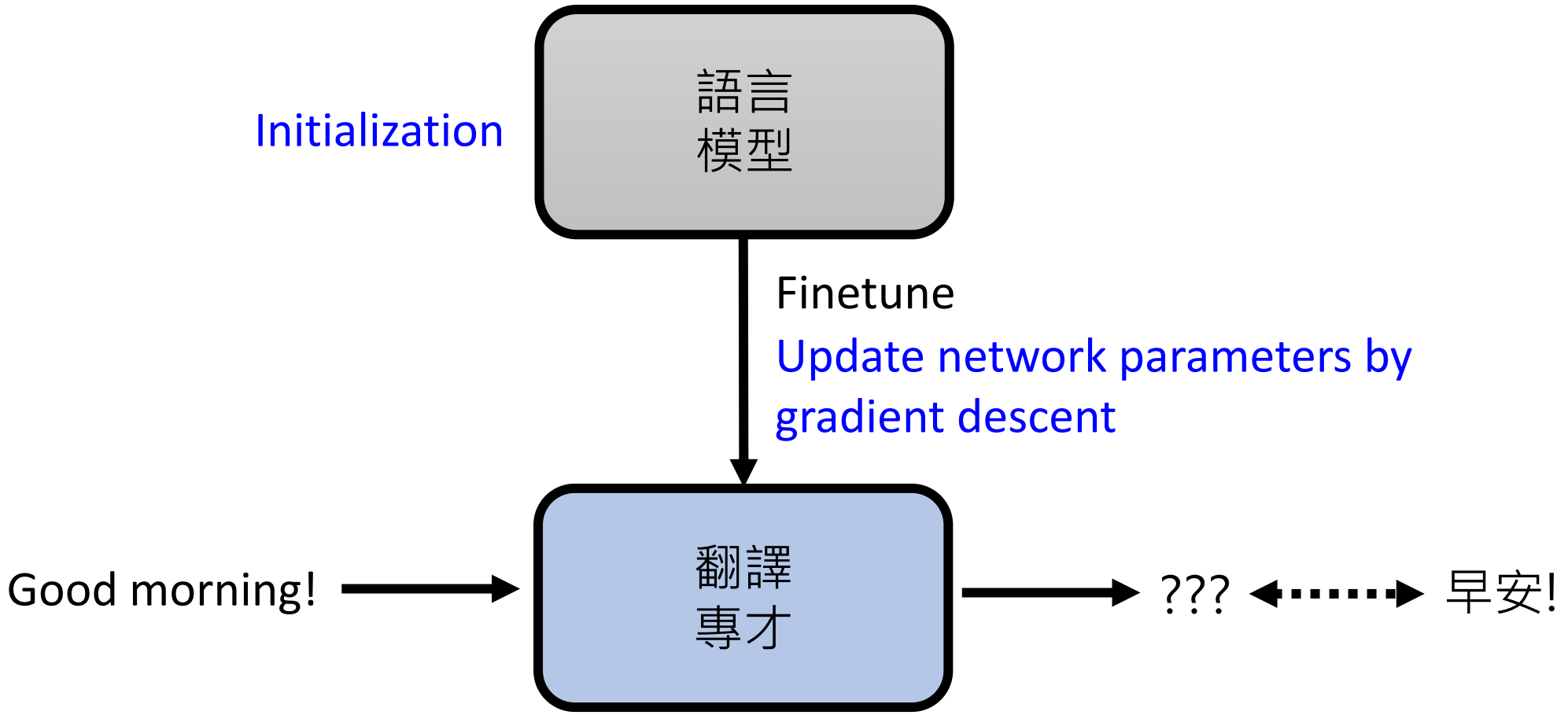




【機器學習2021】自督導式學習 (Self-supervised Learning) (二) - BERT簡介

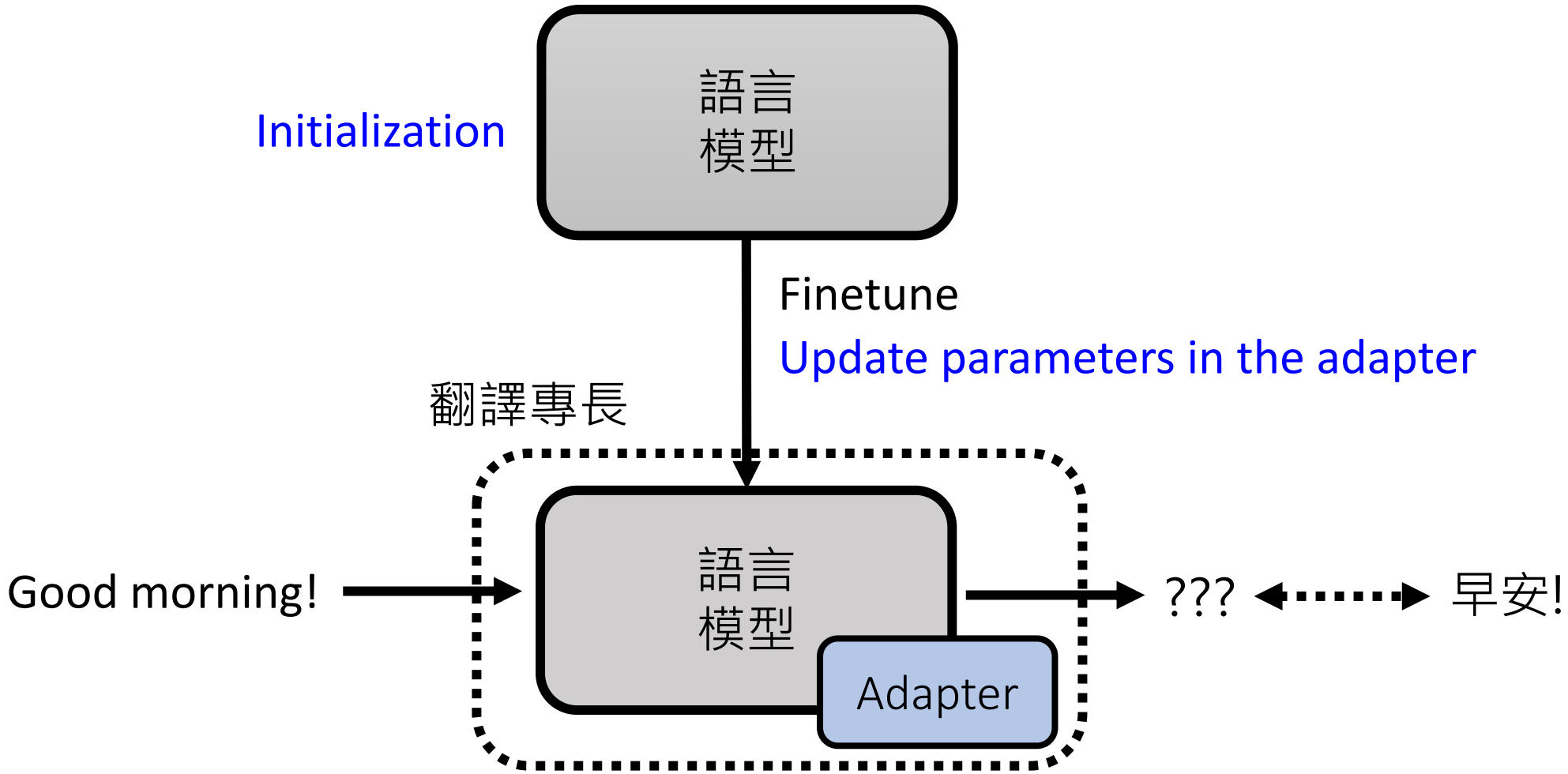
https://youtu.be/gh0hewYkjgo

Source of image: https://leemeng.tw/attack_on_bert_transfer_learning_in_nlp.html

# 對預訓練模型做改造 — 微調 (Finetune)

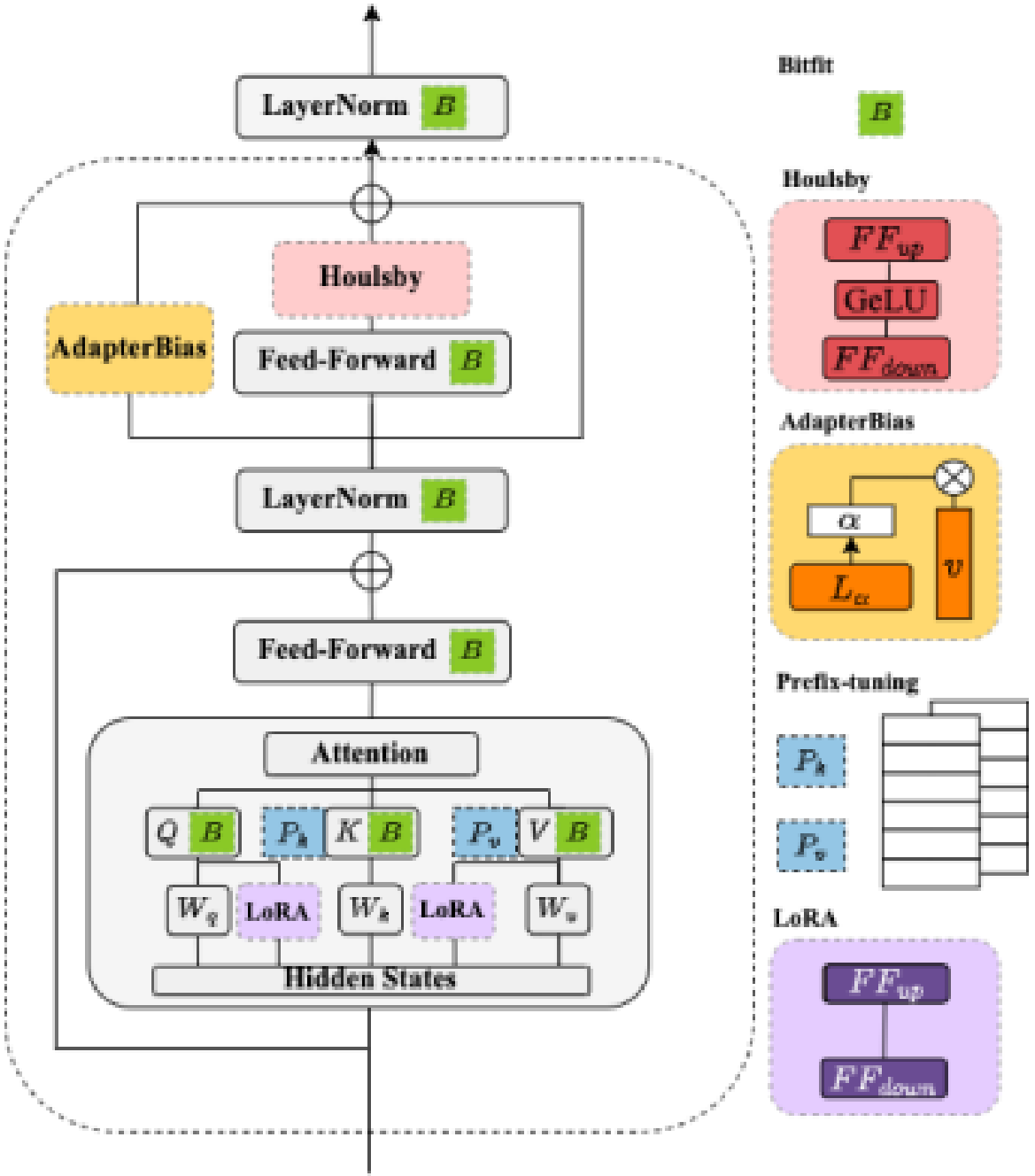


# 對預訓練模型做改造 — Adapter



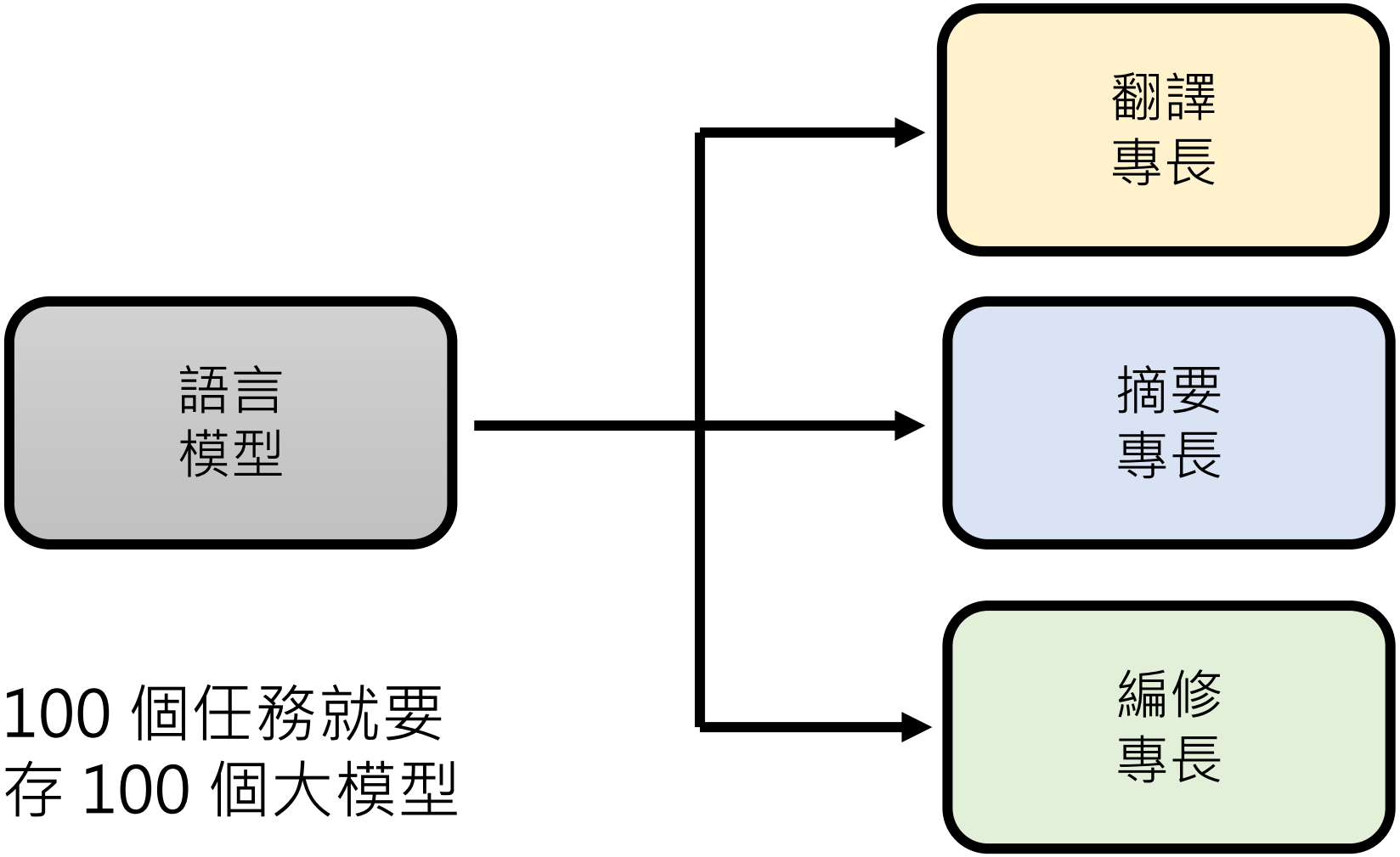
# 各種 Adapter

https://adapterhub.ml/



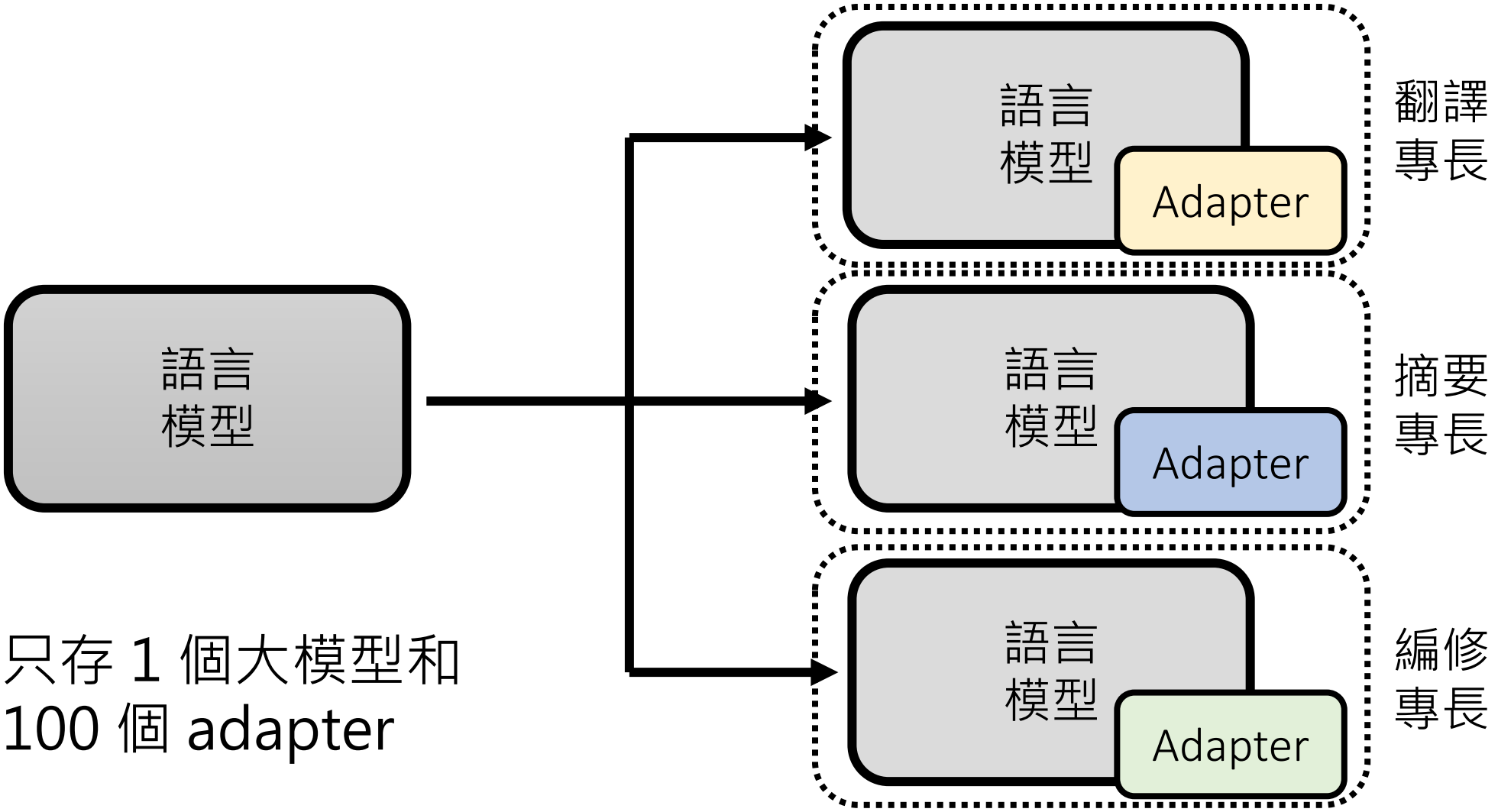

Source of image:
https://arxiv.org/abs/2210.06175

# 對預訓練模型做改造 — Adapter




100 個任務就要
存 100 個大模型

# 對預訓練模型做改造 — Adapter




只存 1 個大模型和
100 個 adapter

# 兩種不同期待導致兩類不同的使用方式

- 期待一：成為專才

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翻譯

This course is about ……

- 期待二：成為通才

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什麼都會

This course is about ……

# 機器要學會讀題目敘述或題目範例

第一部份： 詞彙和結構
本部份共 15 題，每題含一個空格。請就試題冊上 A、B、C、D 四個選項中選出最適合題意的字或詞，標示在答案紙上。

題目敘述

Instruction Learning

例：

It's eight o'clock now. Sue _____ in her bedroom.
A. study
B. studies
C. studied
D. is studying

正確答案為 D，請在答案紙上塗黑作答。

範例 In-context Learning

# How to use GPT?


【機器學習2021】自督導式學習 (Self-supervised Learning) (四) – GPT的野望

https://youtu.be/WY_E0Sd4K80

為什麼 GPT 系列沒有跟 BERT 一樣去微調參數？

- 一開始 OpenAI 對於 AI 就有比較高的期待？
- 因為 BERT 已經做了微調參數，只好另闢蹊徑？

# 機器要學會讀題目敘述或題目範例

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範例 In-context Learning

# In-context Learning

今天天氣真好 分隔 正面 分隔

今天運氣真差 分隔 負面 分隔

這朵花真美 分隔 正面 分隔

我真的是累了 分隔 負面 分隔

**真的能從這些例子學習？**

給一些例子

我感到非常高興 → 語言模型 → 正面

任務：情感分析

# In-context Learning

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

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

今天天氣真好 分隔 負面 分隔

今天運氣真差 分隔 正面 分隔

這朵花真美 分隔 負面 分隔

我真的是累了 分隔 正面 分隔

**故意給錯誤標註**

給一些例子

我感到非常高興 → 語言模型 → 正面

任務：情感分析

# In-context Learning

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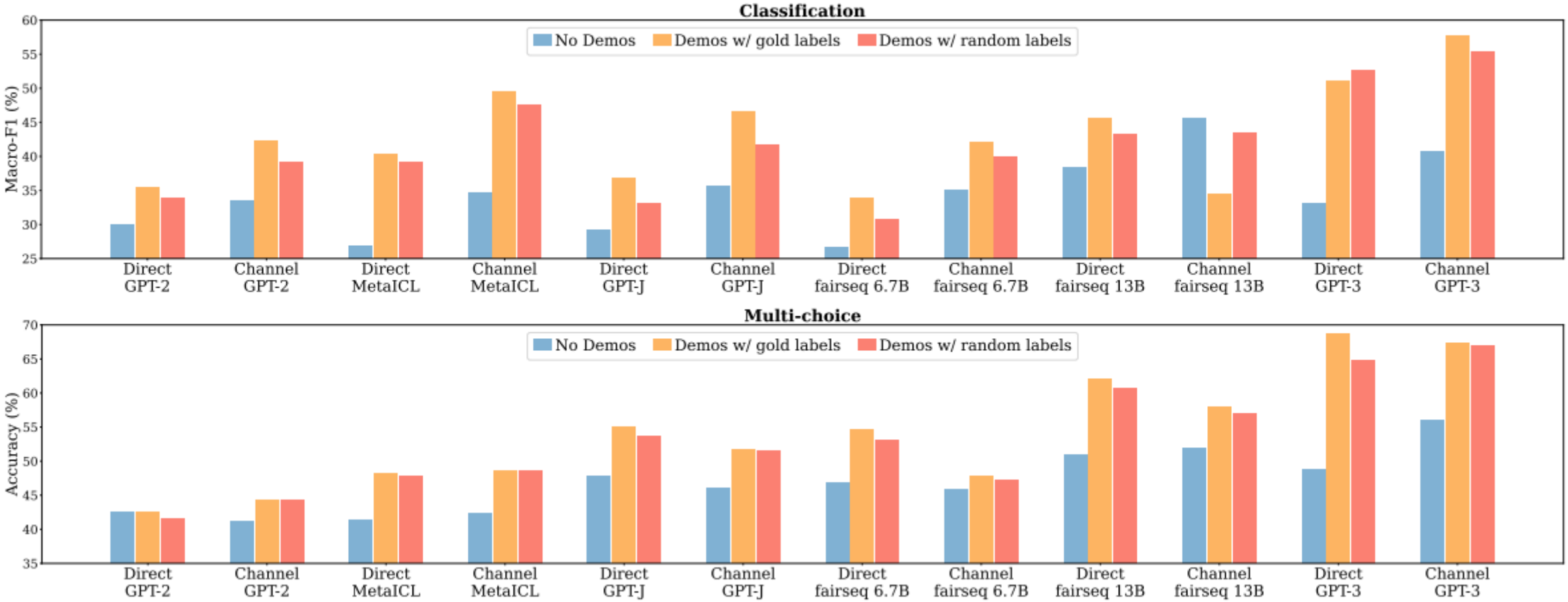

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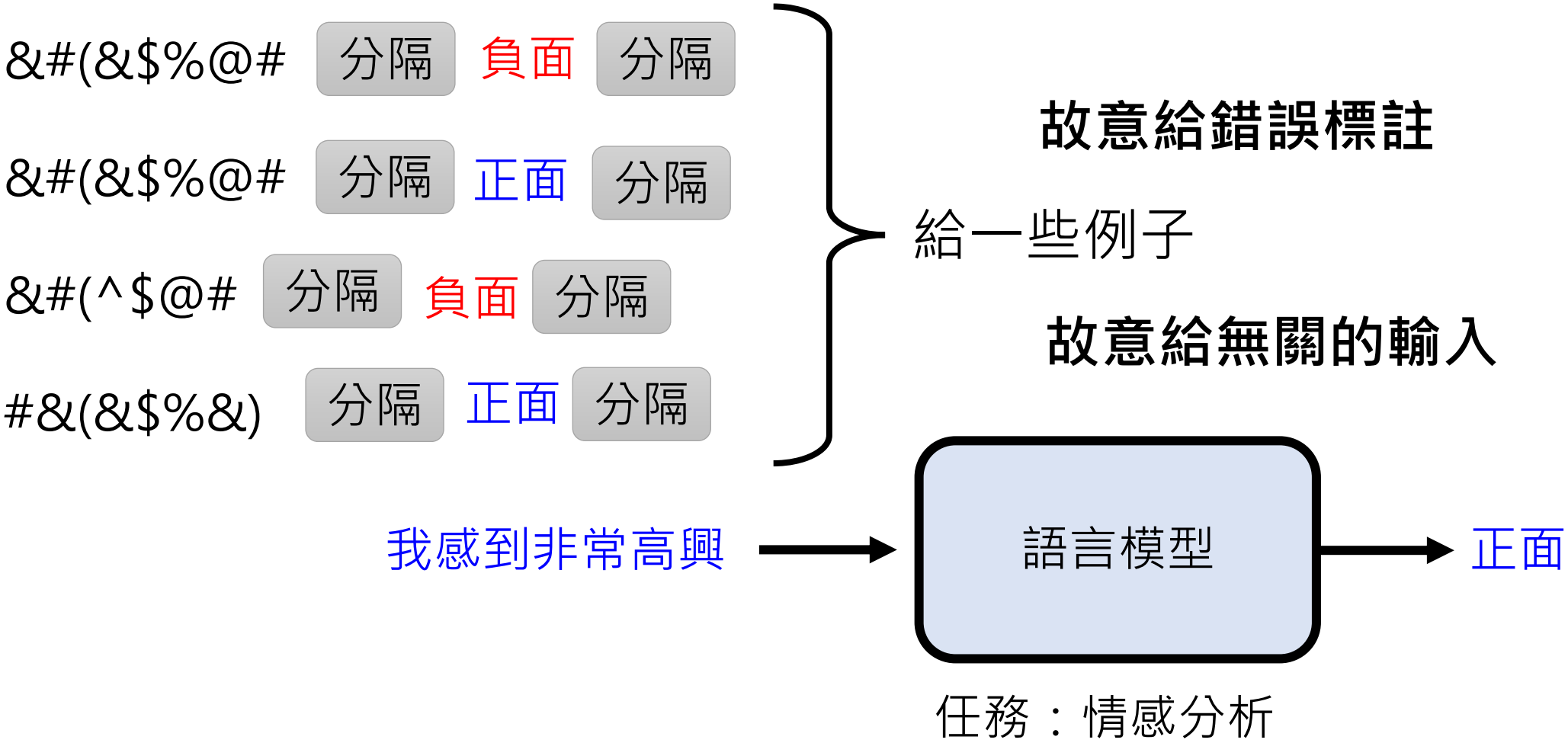

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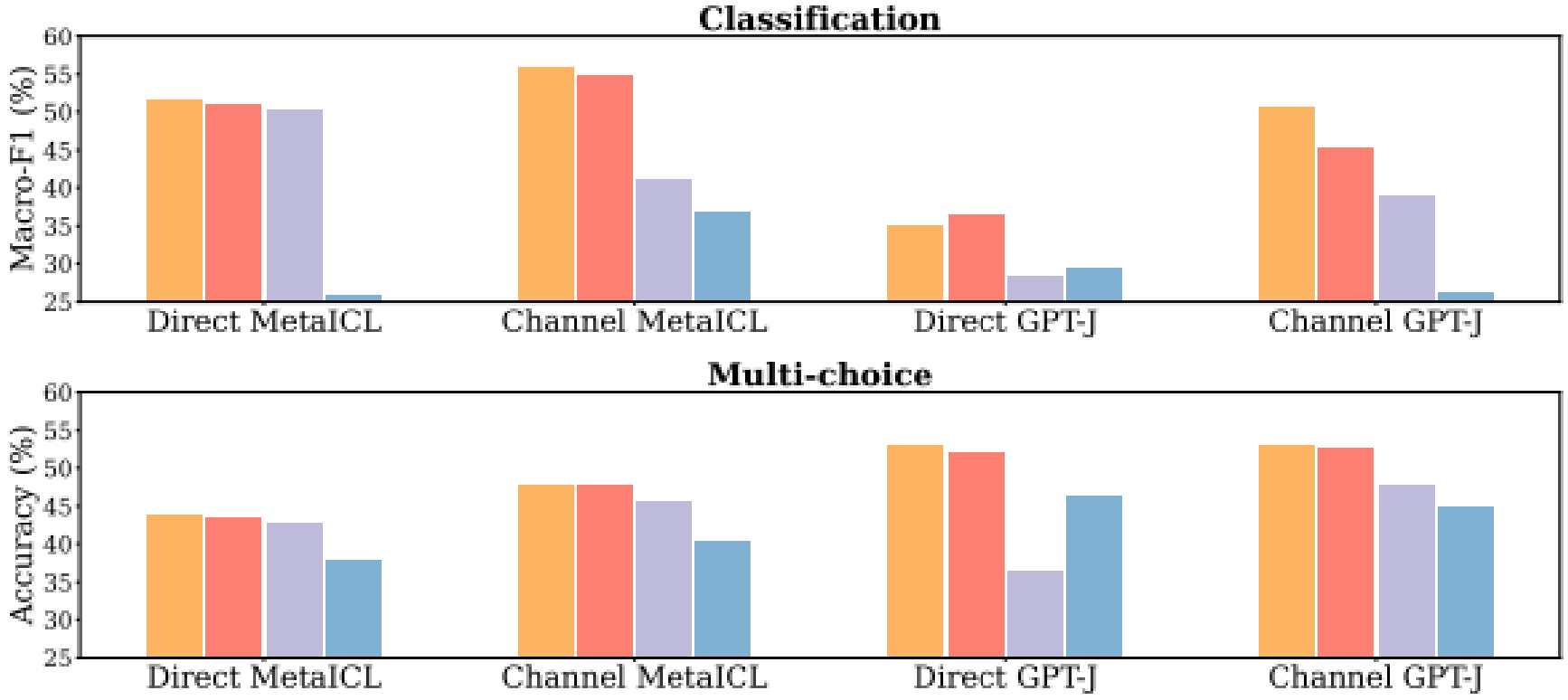


| | *F* | *L* | *I* | *M* |
|---|---|---|---|---|
| Gold labels | ✓ | ✓ | ✓ | ✓ |
| Random labels | ✓ | ✓ | ✓ | ✗ |
| OOD + Random labels | ✓ | ✓ | ✗ | ✗ |
| No demonstrations | ✗ | ✗ | ✗ | ✗ |

*F: Format*
*L: Label space*
*I: Input distribution*
*M: Input-Label Mapping*

# In-context Learning

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這朵花真美 分隔 正面 分隔

我真的是累了 分隔 負面 分隔

本來就會做情感分析，只是需要被指出需要做情感任務

我感到非常高興 → 語言模型 → 正面

任務：情感分析

# In-context Learning

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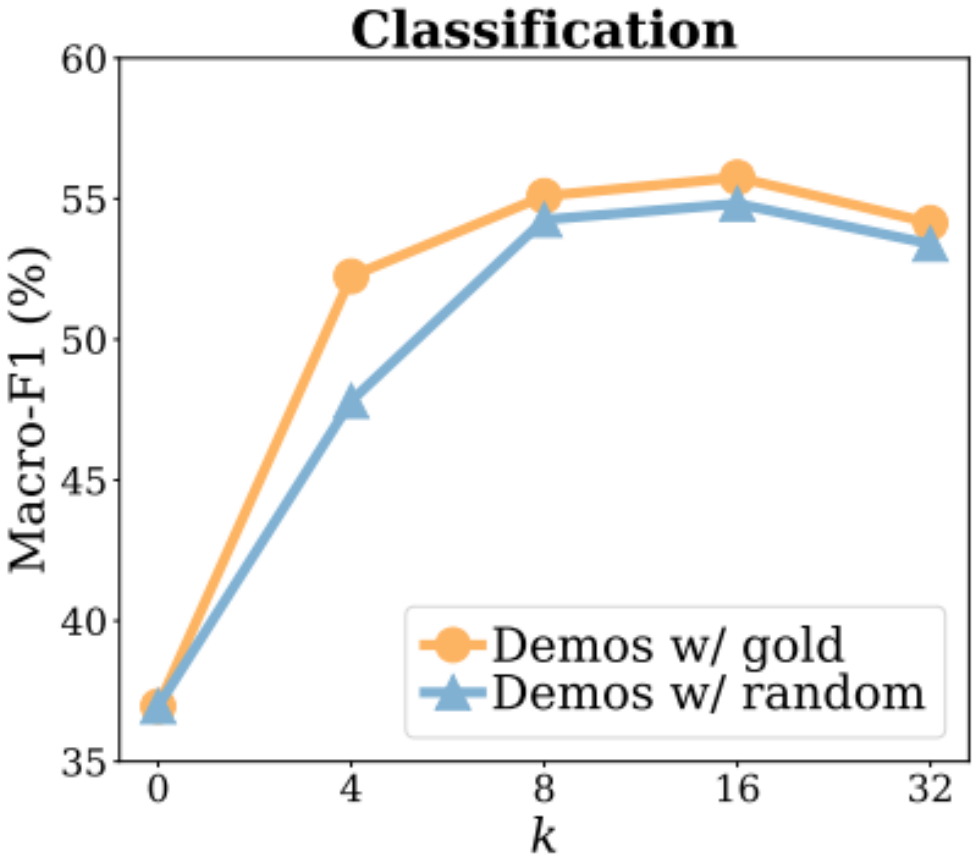
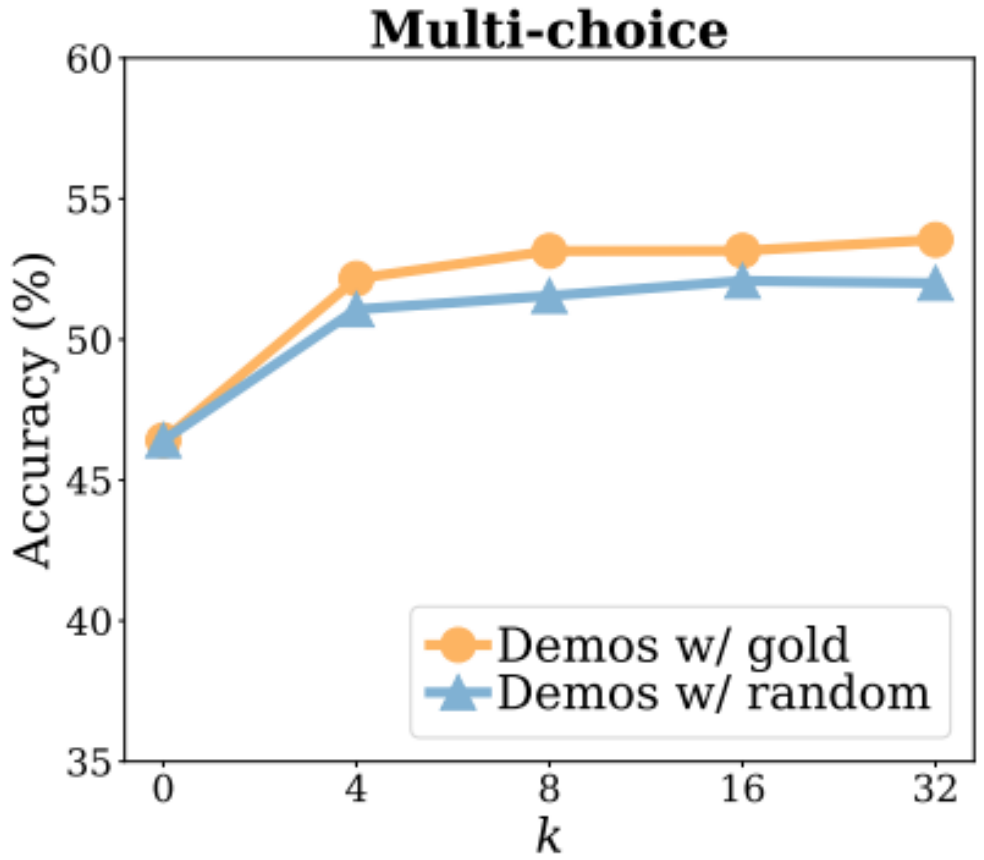
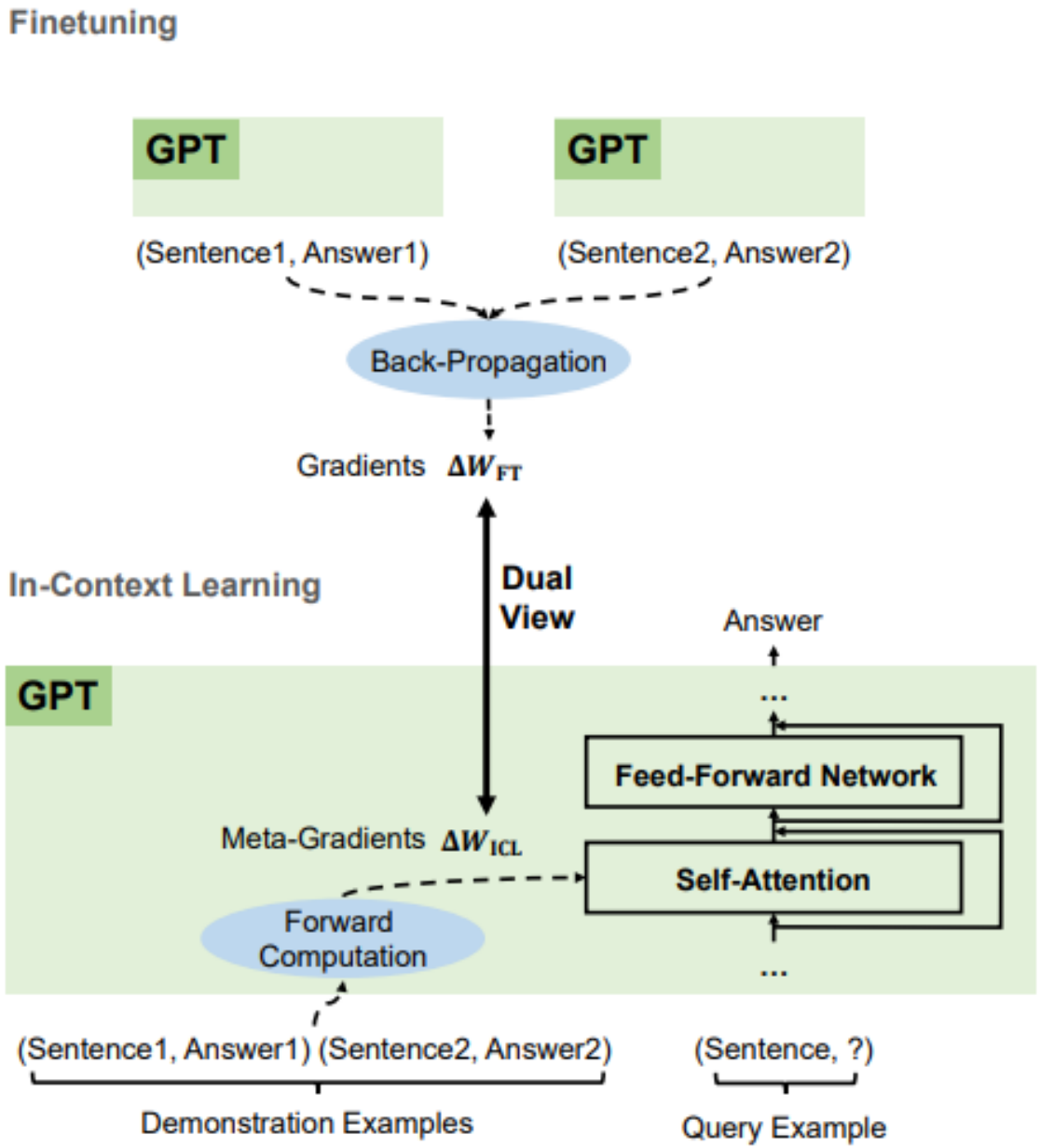


# In-context Learning

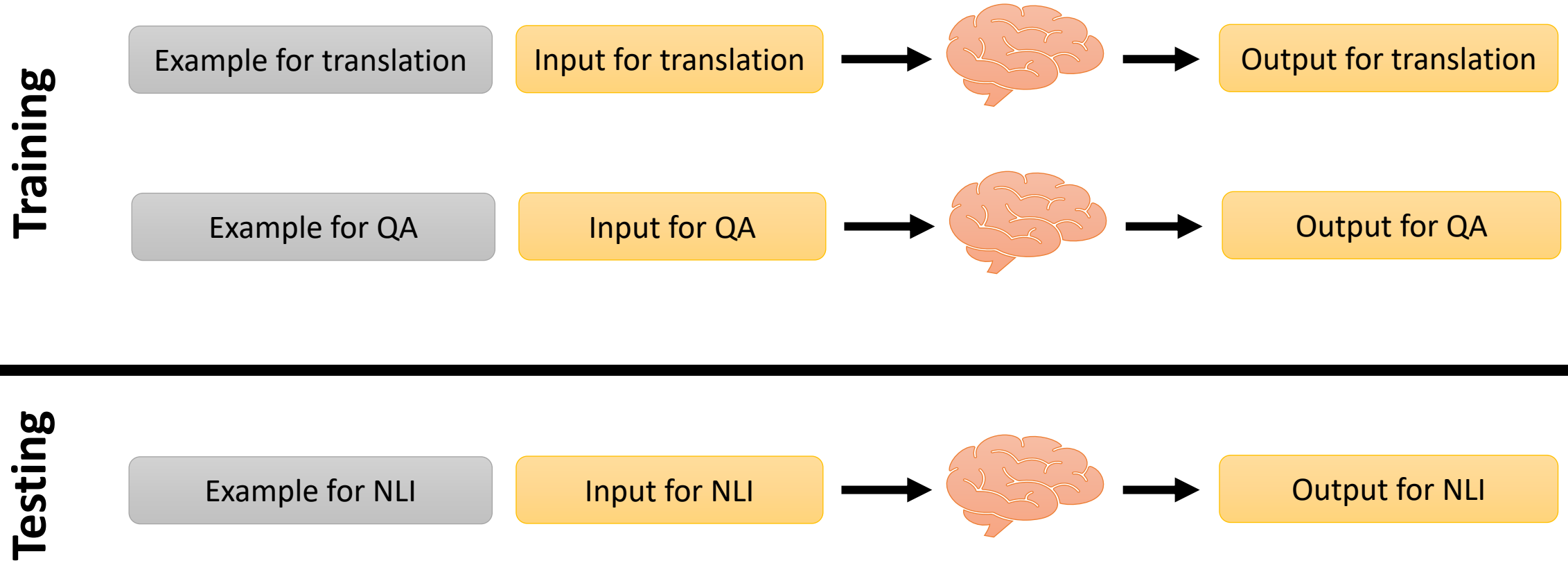



https://arxiv.org/abs/2212.10559

https://arxiv.org/abs/2211.15661

https://arxiv.org/abs/2110.15943

# Learning In-context Learning




NLI = Natural Language Inference

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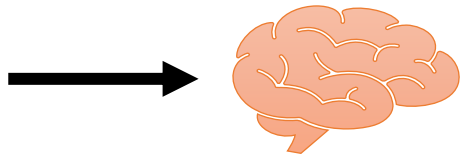
範例 In-context Learning

# Instruction-tuning

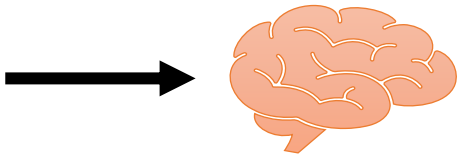
**Training**

對以下文句做翻譯：這堂課我們要講如何駕馭大型語言模型 ……



This course is about ……

對以下文句做摘要：這堂課我們要講如何駕馭大型語言模型 ……



本課程重點為 ……

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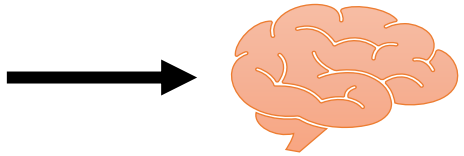
**Testing**

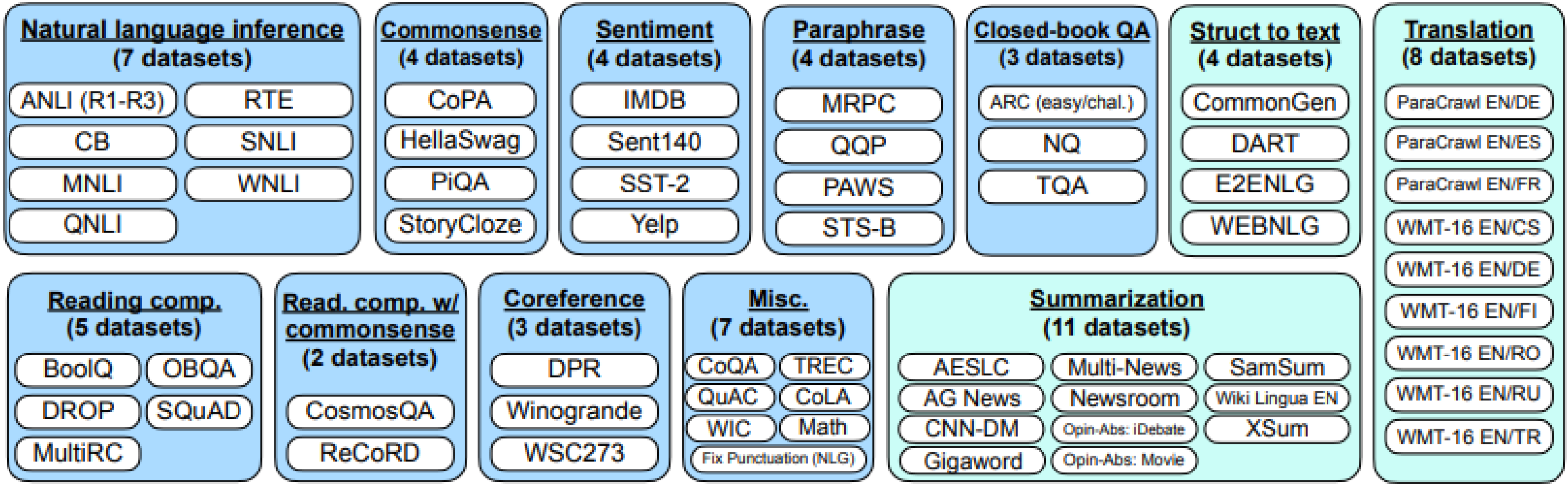
請幫我編修以下文句："How is you?"



"How are you?"

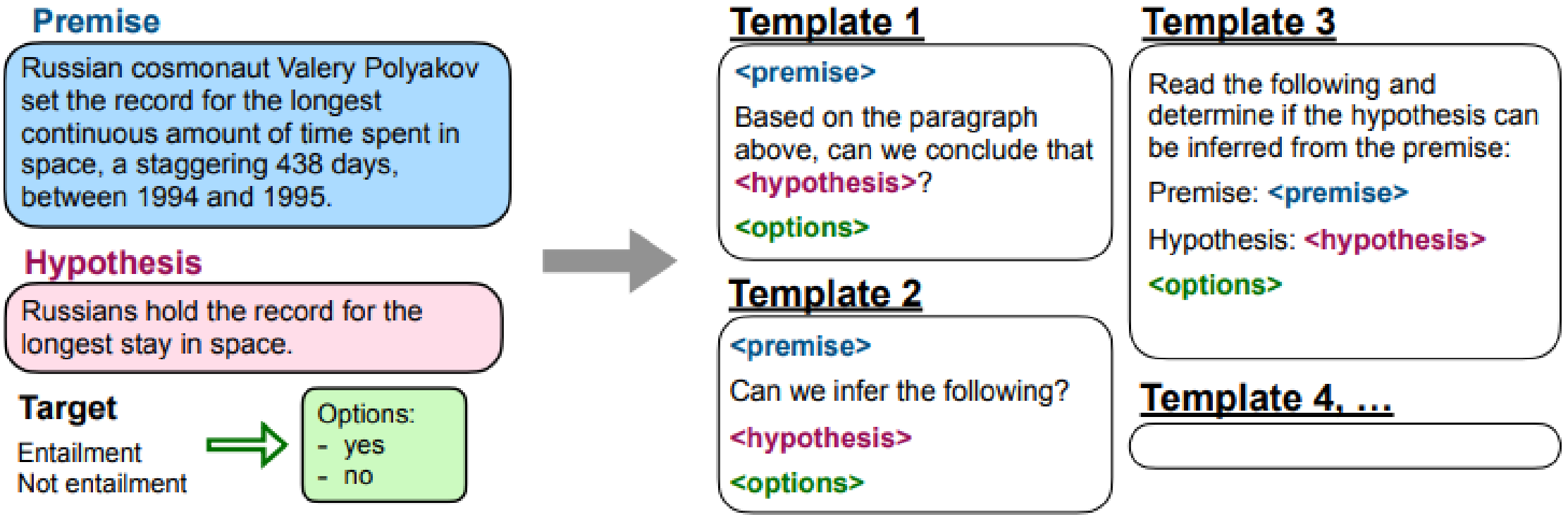
# Instruction-tuning

FLAN (Finetuned Language Net)
https://arxiv.org/abs/2109.01652



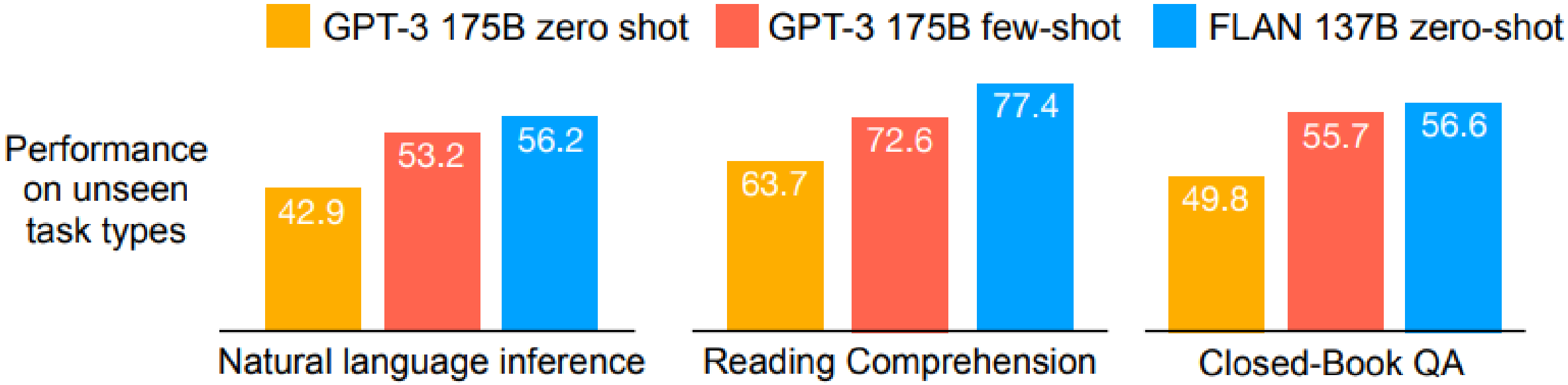
# Instruction-tuning

FLAN (Finetuned Language Net)
https://arxiv.org/abs/2109.01652



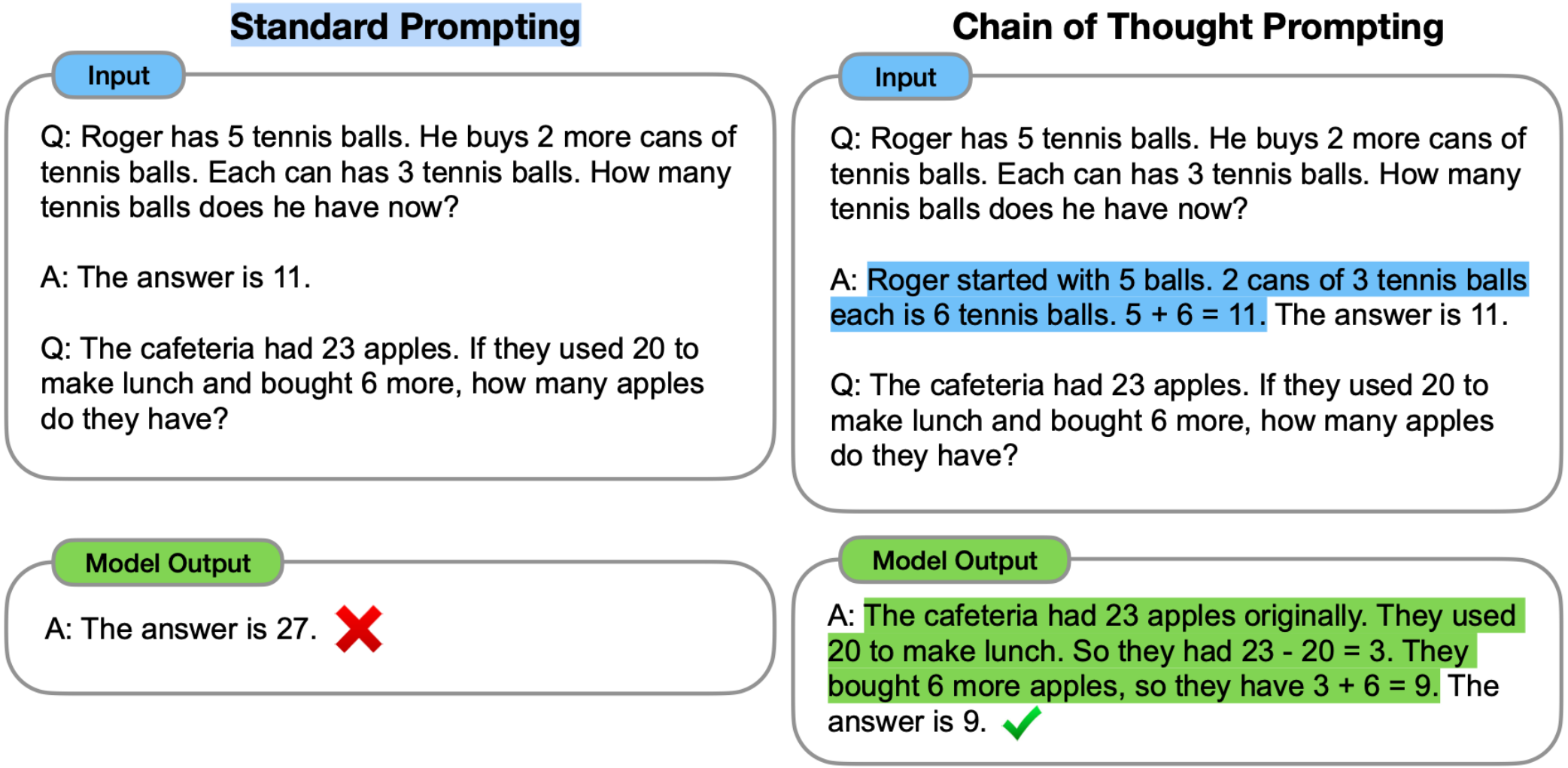
# Instruction-tuning

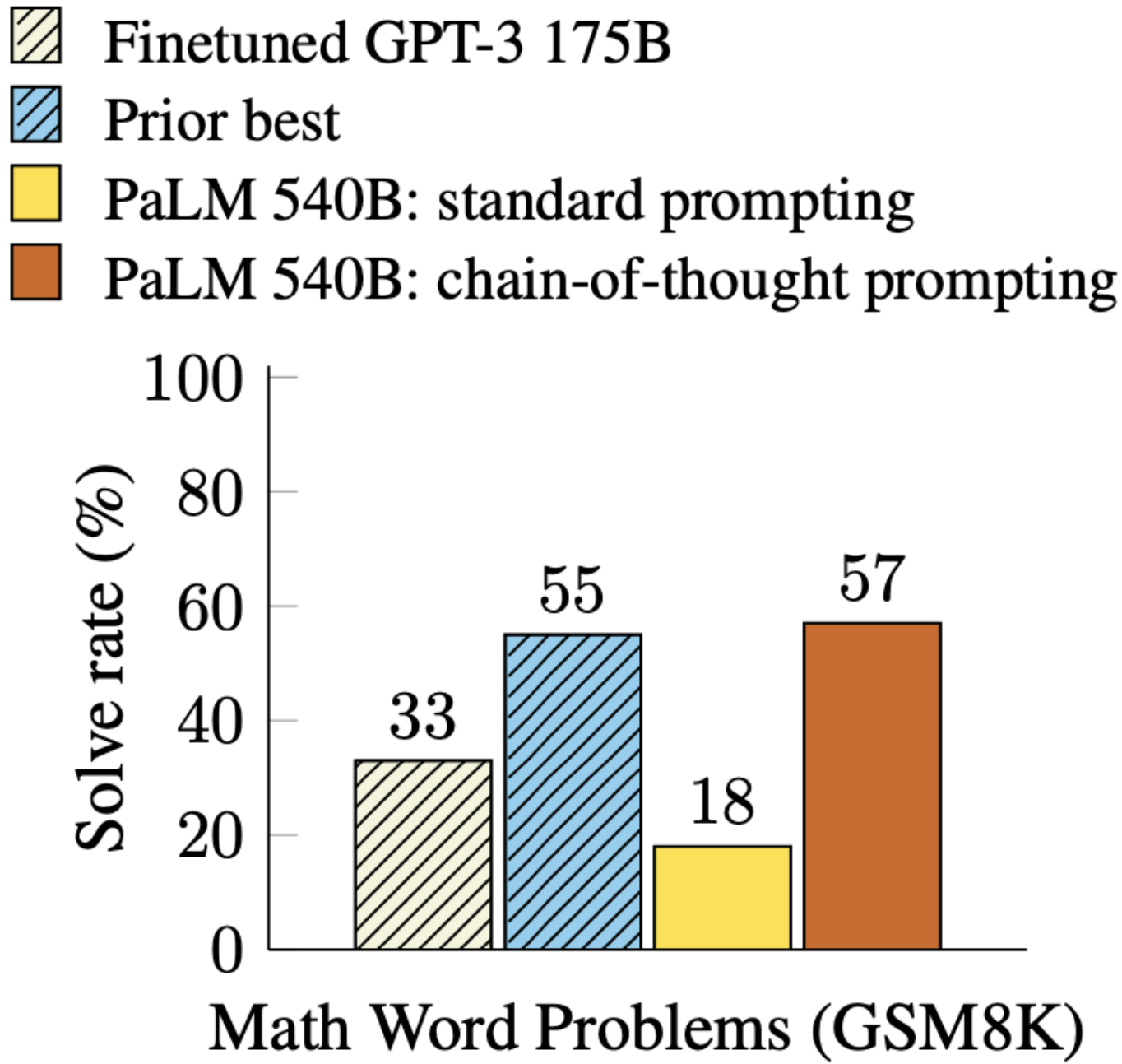
FLAN (Finetuned Language Net)
https://arxiv.org/abs/2109.01652



Ref: https://arxiv.org/abs/2201.11903

# Chain of Thought (CoT) Prompting

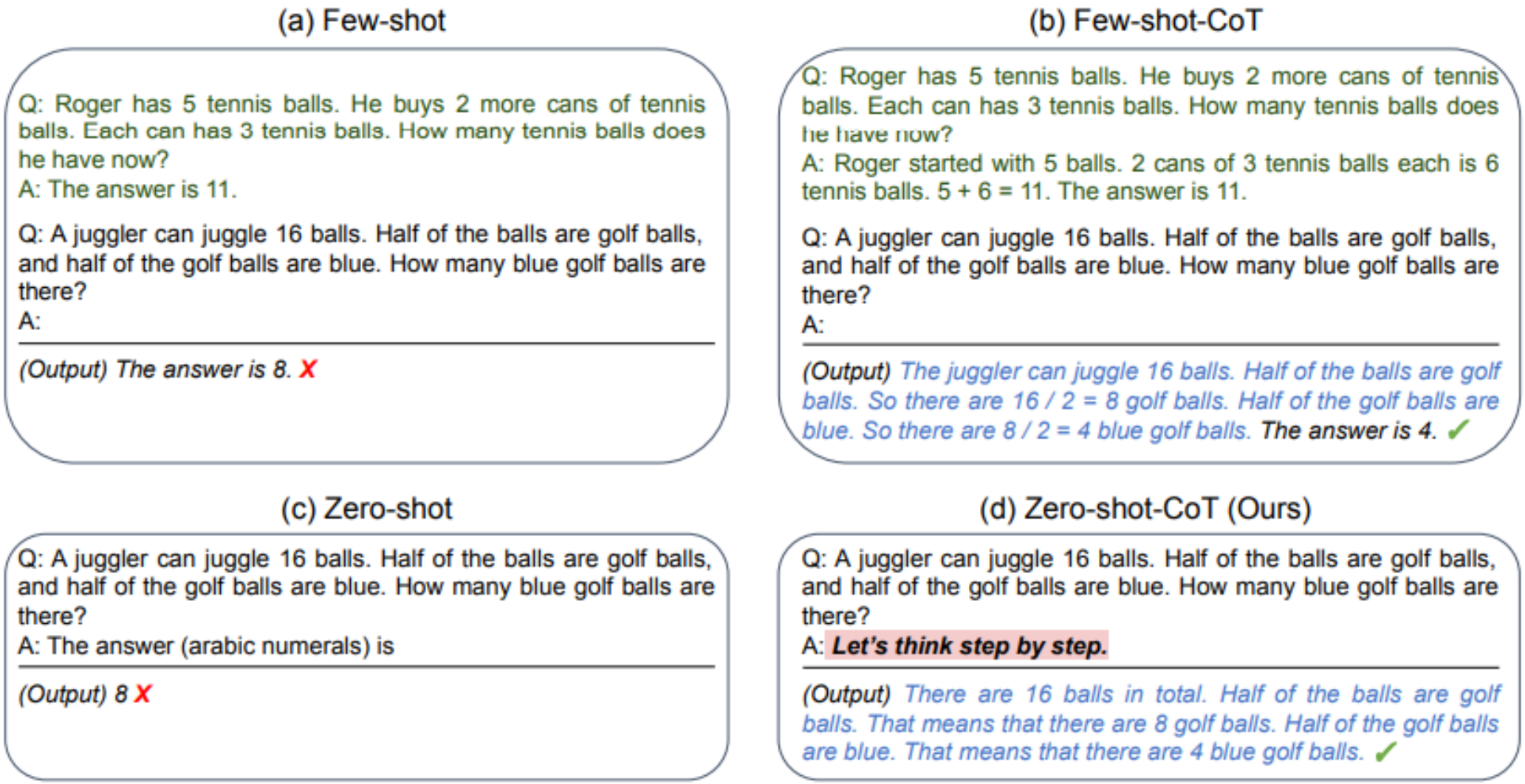
- 




Ref: https://arxiv.org/abs/2201.11903

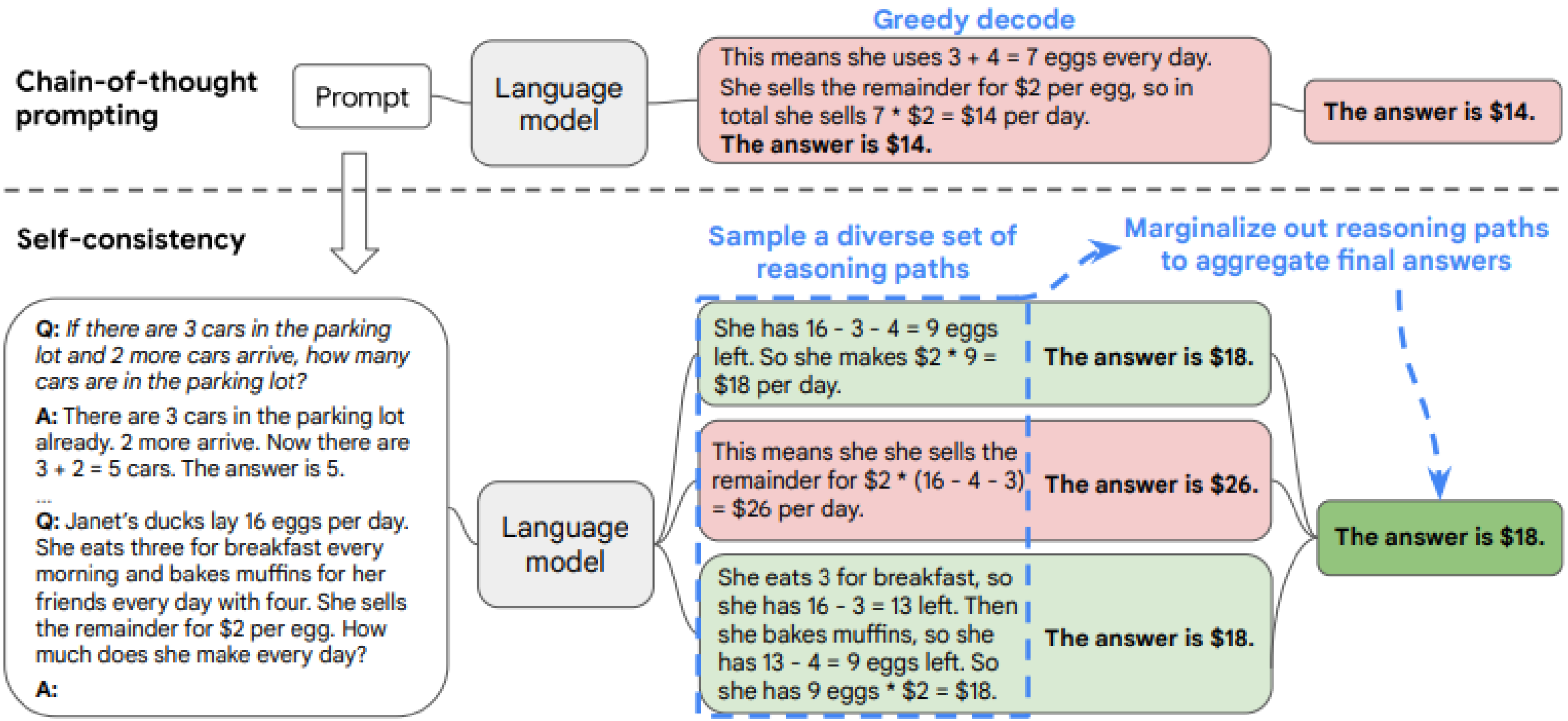
Ref: https://arxiv.org/abs/2205.11916

# Chain of Thought (CoT) Prompting



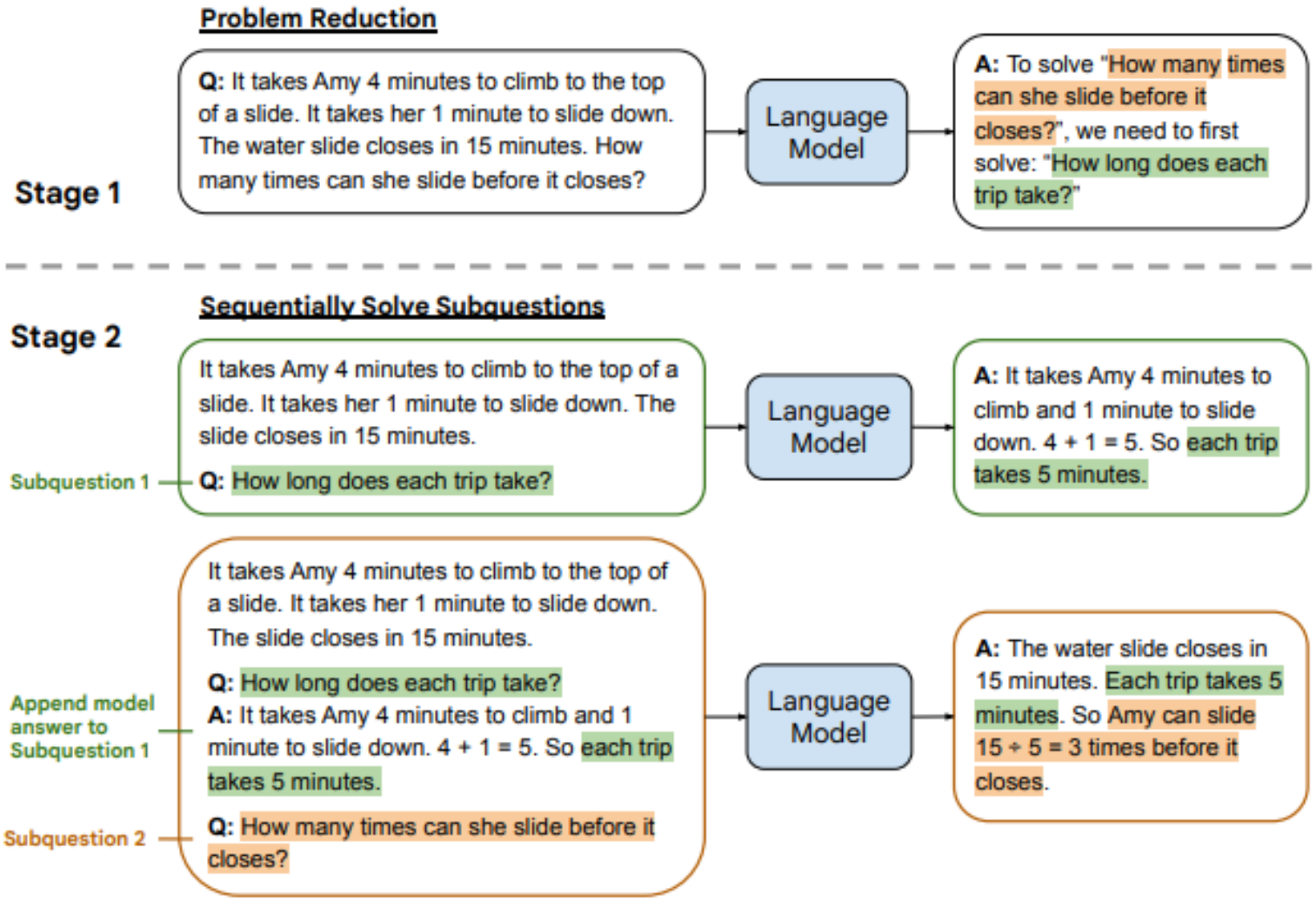
Ref: https://arxiv.org/abs/2203.11171

# Chain of Thought (CoT) Prompting



Ref: https://arxiv.org/abs/2205.10625

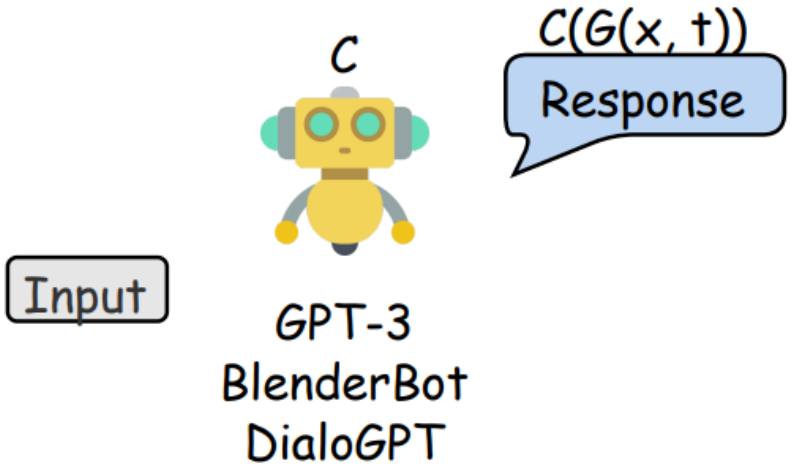
# Chain of Thought (CoT) Prompting



https://arxiv.org/abs/2206.03931

# 用機器來找 Prompt

- Using reinforcement learning



https://arxiv.org/abs/2211.01910

# 用機器來找 Prompt

- Using an LM to find prompt

今天天氣真好 分隔 正面 分隔

今天運氣真差 分隔 負面 分隔

這朵花真美 分隔 正面 分隔

我真的是累了 分隔 負面 分隔

**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:

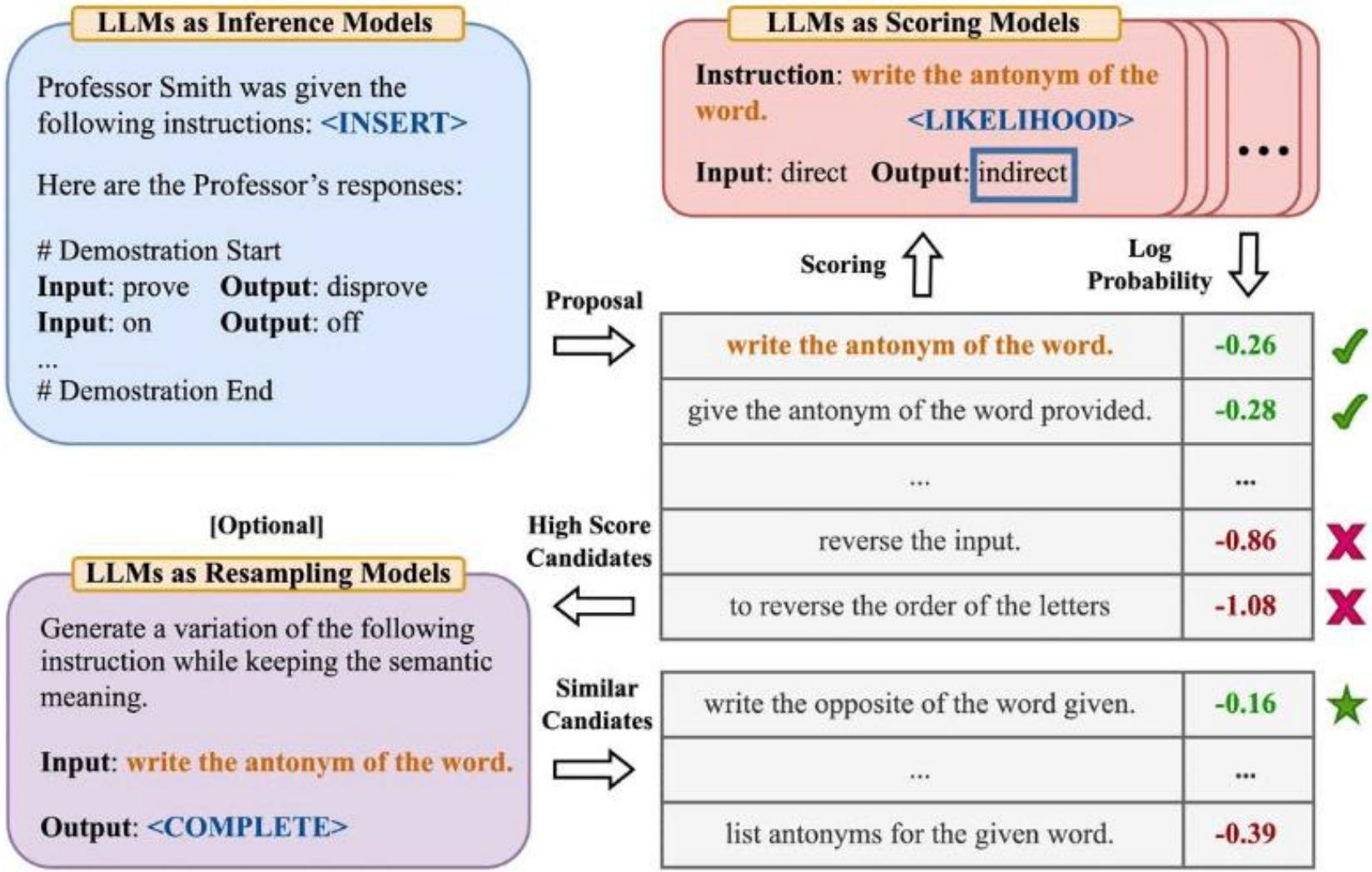
**Input**: $[Q_1]$ **Output**: $[A_1]$
**Input**: $[Q_2]$ **Output**: $[A_2]$
...

The instruction was <COMPLETE>

請決定這句話是正面還是負面

https://arxiv.org/abs/2211.01910

# 用機器來找 Prompt



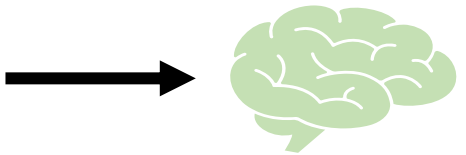
https://sites.google.com/view/automatic-prompt-engineer

| No. | Category | Zero-shot CoT Trigger Prompt | Accuracy |
|---|---|---|---|
| 1 | APE | Let's work this out in a step by step way to be sure we have the right answer. | **82.0** |
| 2 | Human-Designed | Let's think step by step. (*1) | 78.7 |
| 3 | | First, (*2) | 77.3 |
| 4 | | Let's think about this logically. | 74.5 |
| 5 | | Let's solve this problem by splitting it into steps. (*3) | 72.2 |
| 6 | | Let's be realistic and think step by step. | 70.8 |
| 7 | | Let's think like a detective step by step. | 70.3 |
| 8 | | Let's think | 57.5 |
| 9 | | Before we dive into the answer, | 55.7 |
| 10 | | The answer is after the proof. | 45.7 |
| - | | (Zero-shot) | 17.7 |

# 兩種不同期待導致兩類不同的使用方式

- 期待一：成為專才

這堂課我們要講如何駕馭大型語言模型 .....



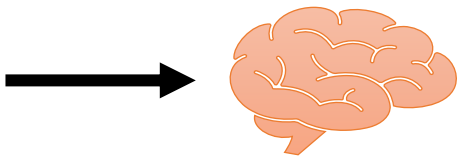
翻譯

This course is about .....

- 期待二：成為通才

對以下文句做**翻譯**：

這堂課我們要講如何駕馭大型語言模型 .....



什麼都會

This course is about .....

AACL 2022 Tutorial: Recent Advances in Pre-trained Language Models: Why Do They Work and How to Use Them

Link: https://d223302.github.io/AACL2022-Pretrain-Language-Model-Tutorial/