FrugalGPT:
來看看窮人怎麼用 ChatGPT

Frugal: 節儉

FrugalGPT: How to Use Large Language Models While Reducing Cost and Improving Performance

Lingjiao Chen, Matei Zaharia, James Zou

Stanford University

https://arxiv.org/abs/2305.05176

GPT4 的 API 也是很花錢的

- 輸入：0.03$ / 1000 tokens
- 輸出：0.06$ / 1000 tokens

假設每次使用輸入 1000 tokens 、輸出 1000 tokens

每次使用需要 0.03$ + 0.06$ = 0.09$ (2.78 新台幣)

桃市府試驗以ChatGPT分析1999陳情案件

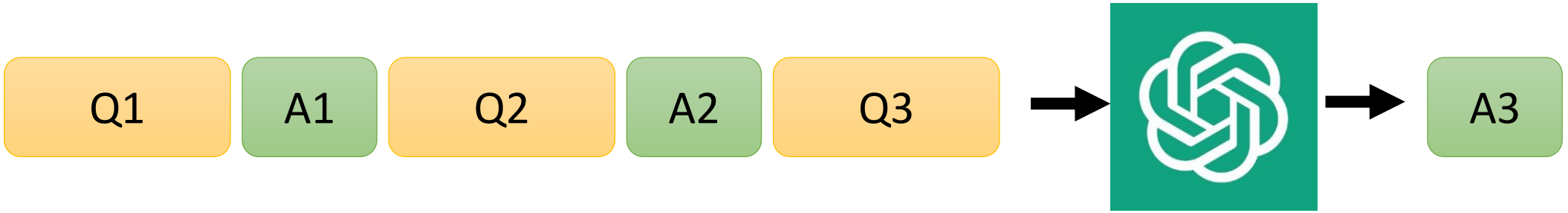
https://news.ltn.com.tw/news/politics/breakingnews/4273981

「1999臺北市民當家熱線」平均每月服務 15 萬 7,522 通電話

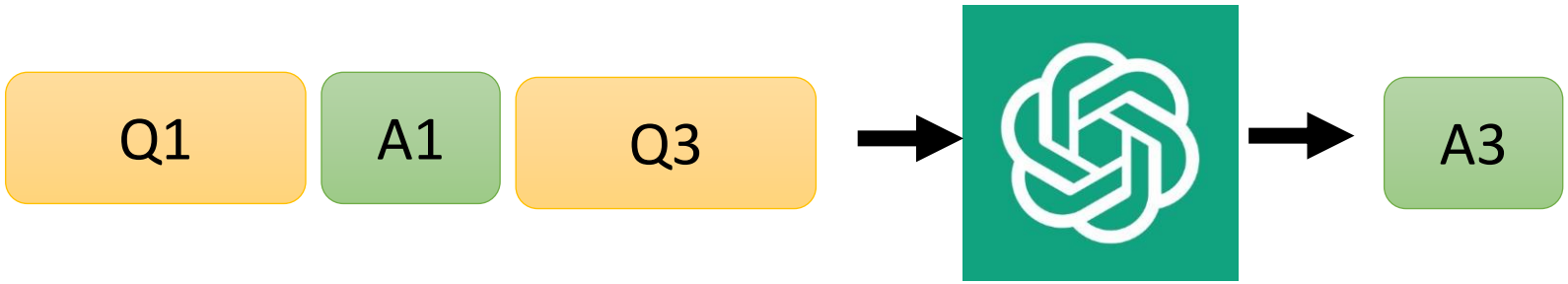
https://rdec.gov.taipei/cp.aspx?n=EE54BD6678096F88

方法一: Prompt Adaptation (縮短輸入)

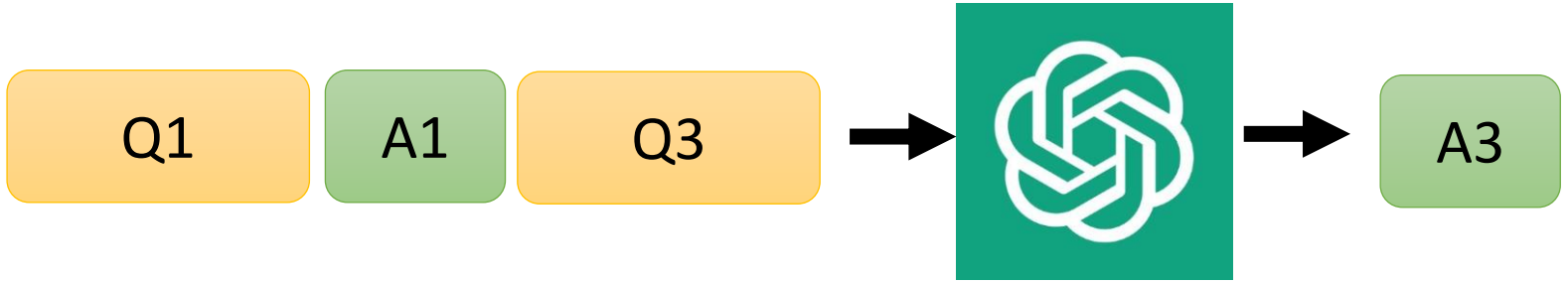
- In-context learning

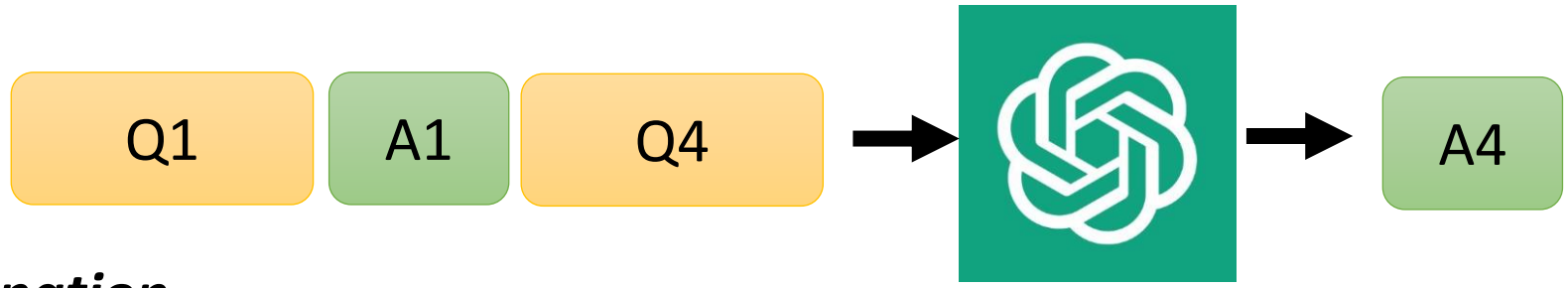


Prompt Selection

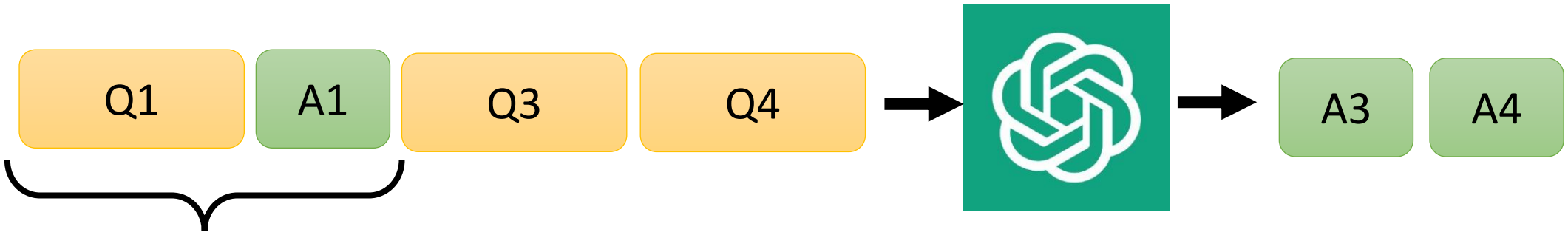


方法一: Prompt Adaptation (縮短輸入)





Query Concatenation

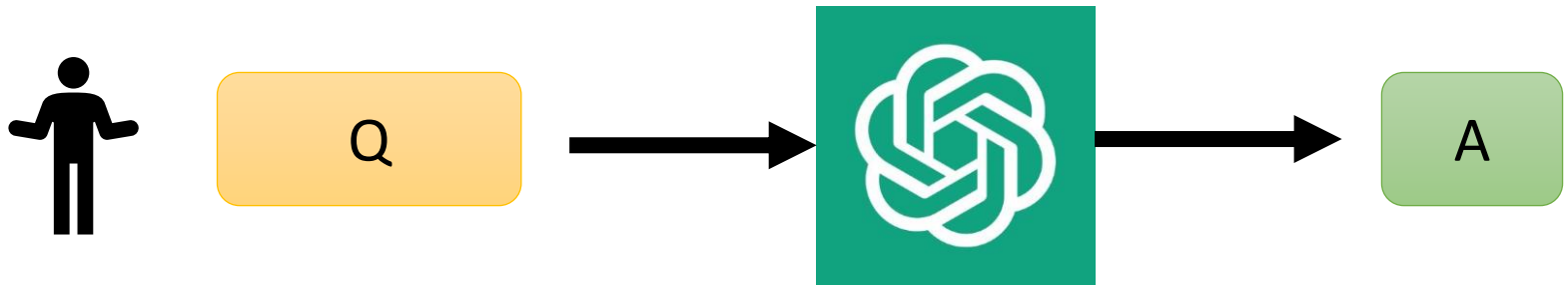


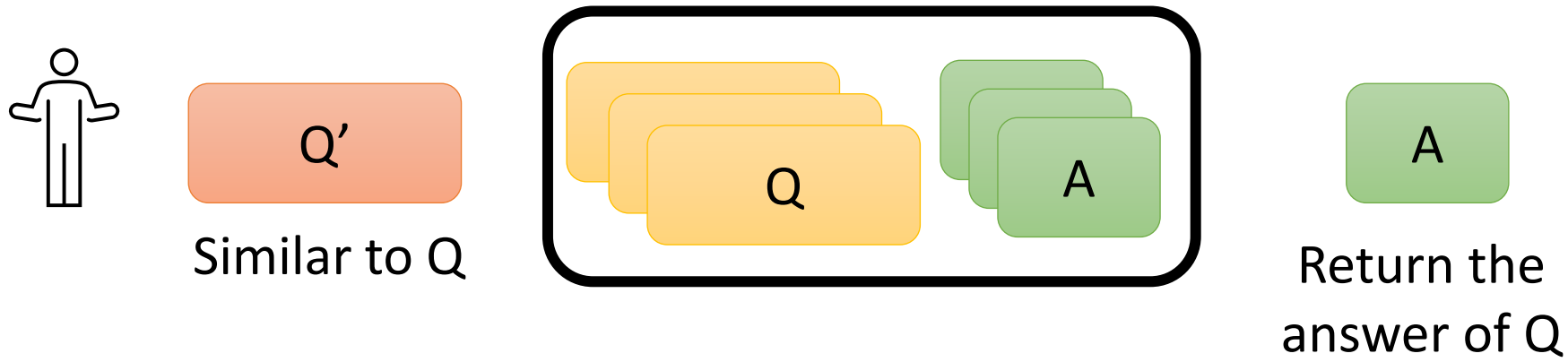
方法二: LLM Approximation (自建模型)

【生成式AI】窮人如何低資源復刻自己的 ChatGPT https://youtu.be/rK_rZFew1yc

方法二: LLM Approximation (自建模型)

- Completion Cache



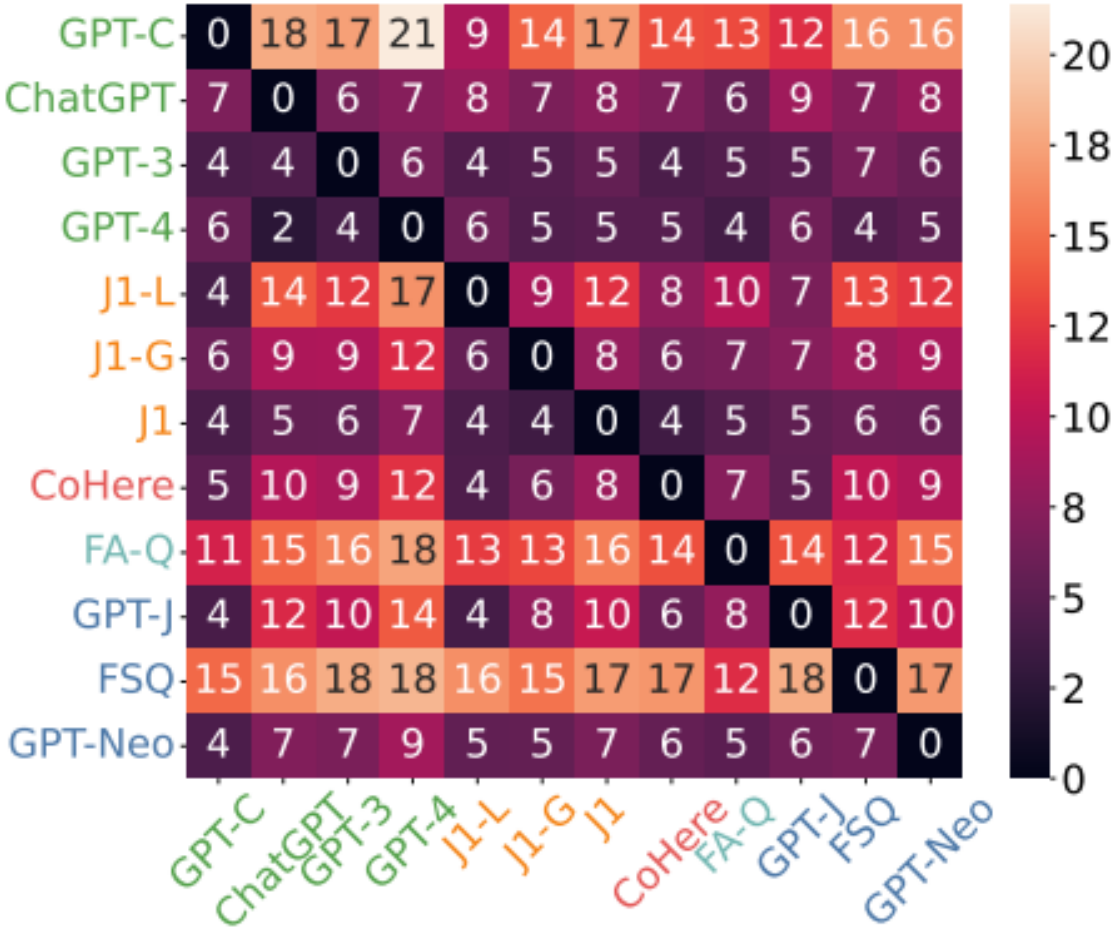


方法三: LLM cascade

Provider	API	Size/B	Cost (USD)		
			1M input tokens	1M output tokens	request
OpenAI	GPT-Curie	6.7	2	2	0
	ChatGPT	NA	2	2	0
	GPT-3	175	20	20	0
	GPT-4	NA	30	60	0
AI21	J1-Large	7.5	0	30	0.0003
	J1-Grande	17	0	80	0.0008
	J1-Jumbo	178	0	250	0.005
Cohere	Xlarge	52	10	10	0
ForeFrontAI	QA	16	5.8	5.8	0
Textsynth	GPT-J	6	0.2	5	0
	FAIRSEQ	13	0.6	15	0
	GPT-Neox	20	1.4	35	0

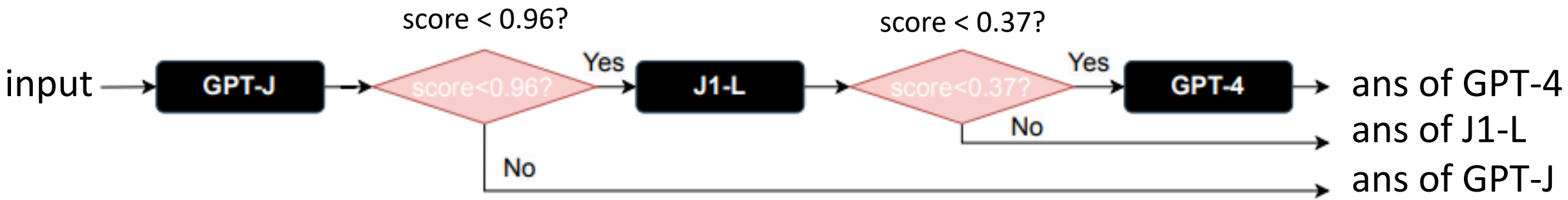
方法三: LLM cascade

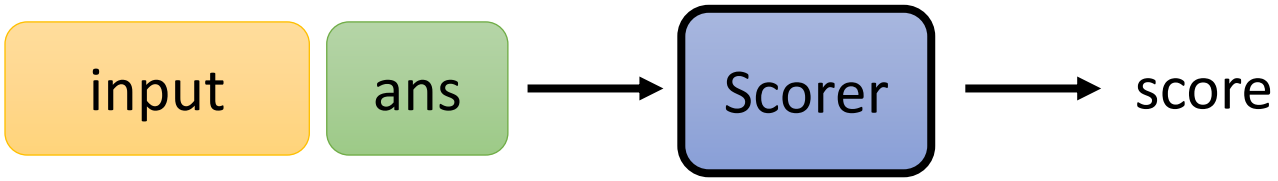
- 殺雞不用牛刀
  - 簡單的問題交給比較弱 (比較便宜) 的模型
  - 只有難的問題才給比較強 (比較貴) 的模型
- 不同模型的能力可能可以互補



HEADLINES

方法三: LLM cascade





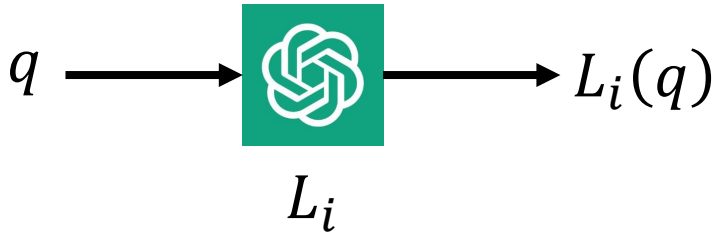
(需要另外訓練)

Approch	Accuracy	Cost ($)
GPT-4	0.857	33.1
FrugalGPT	**0.872**	**6.5**

方法三: LLM cascade

$$\mathcal{L} = \{L_1, L_2, \dots, L_k\}$$

$$\mathcal{T} = \{\lambda_1, \lambda_2, \dots, \lambda_{k-1}\}$$



$r\big(a, L_i(q)\big)$: performance of L_i

$s\big(q, L_i(q)\big)$: score from scorer

$$\max_{\mathcal{L},\mathcal{T}} \sum_{q,a} r\big(a, L_z(q)\big)$$

z is the minimum i such that $s\big(q, L_i(q)\big) > \lambda_i$

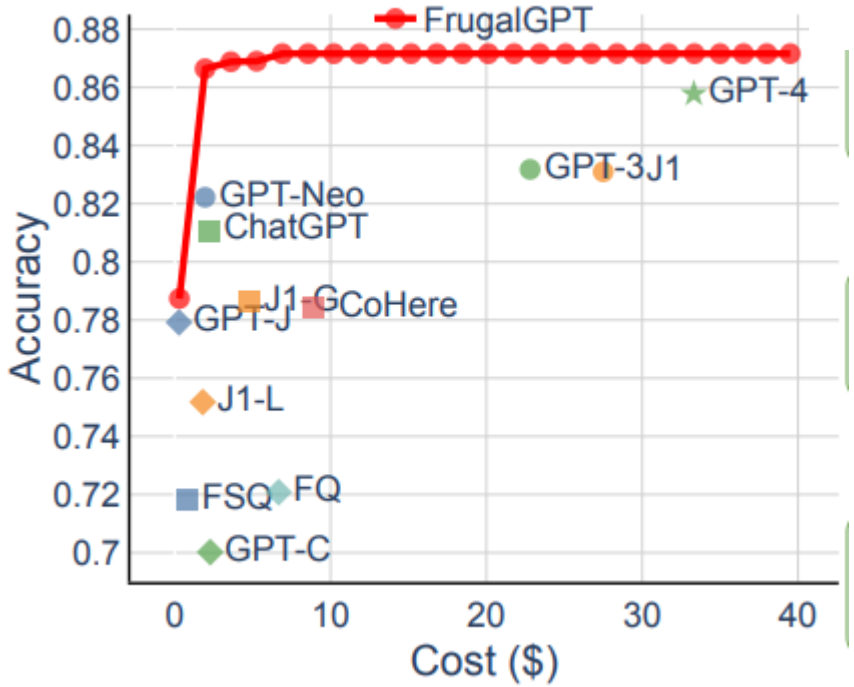
Cost of each request:

$$c_{L_i,1}\|q\| + c_{L_i,2}\|L_i(q)\| + c_{L_i,3}$$

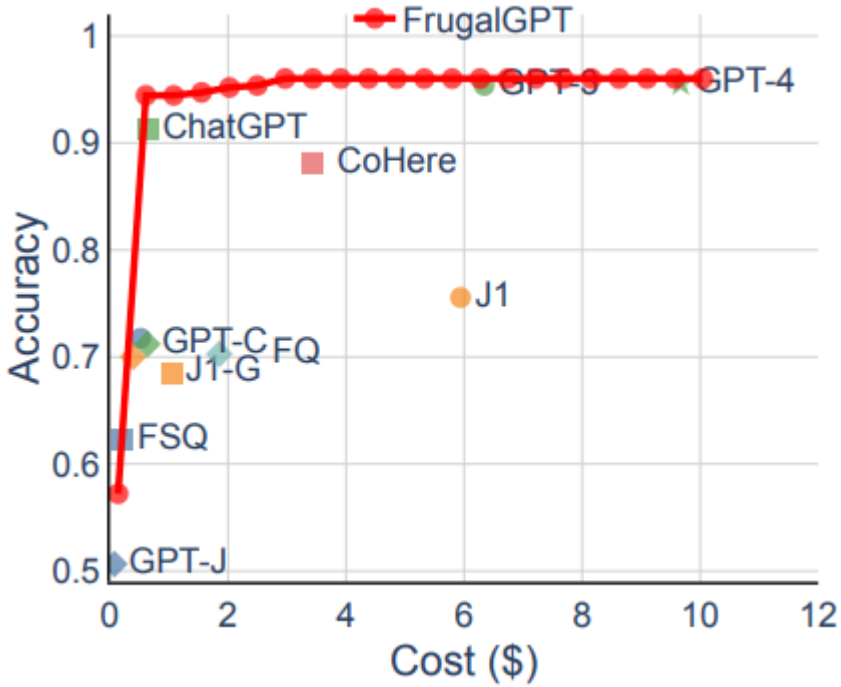
$$\sum_{q} \sum_{i=1}^{z} \left[c_{L_i,1}\|q\| + c_{L_i,2}\|L_i(q)\| + c_{L_i,3}\right] < B$$

(budget)

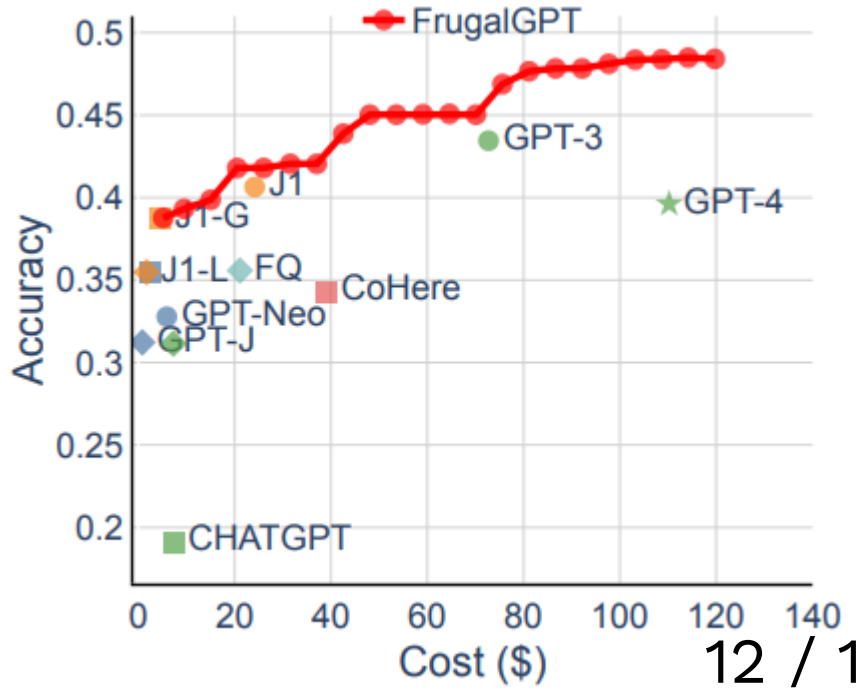
HEADLINES



OVERRULING



COQA



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