Small Language Model Can Self-Correct

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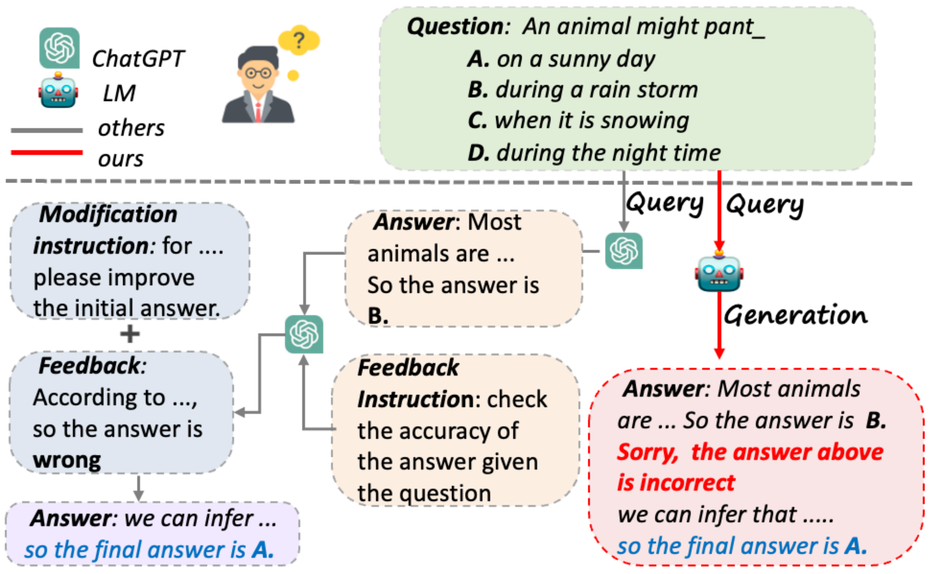
Motivation

Previous studies have devised sophisticated pipelines and prompts to induce large LMs to exhibit the capability for self-correction.

- **Challenge 1**:large LMs are explicitly prompted to verify and modify its answers separately rather than completing all steps spontaneously like humans.
- **Challenge 2**: these complex prompts are extremely challenging for small LMs to follow.

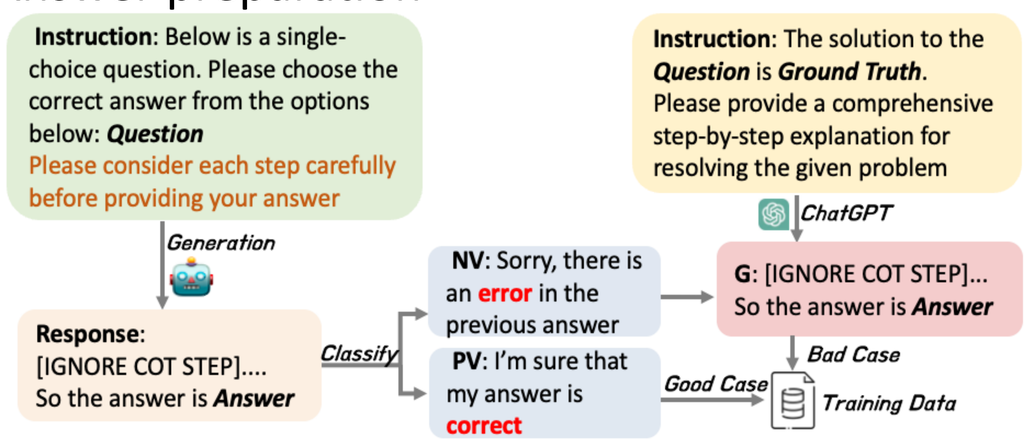
We introduce the *Intrinsic Self-Correction (ISC)* in generative language models, aiming to correct the initial output of LMs in a self-triggered manner, even for those small LMs with 6 billion parameters.



Methods

Build Self-correction Data

- Question preparation
- Answer preparation



Partial Answer Mask

⭐ Refrain from computing the loss corresponding to the incorrect answer part in the output during training

Question: *(TaskP)* Examine the following options carefully and select the correct one. *(COTP)* Before providing your final answer, give the analysis steps. *(SCP)* And you need double-check your response for accuracy before proceeding to submit.
(question) Where do you buy tickets at a ticket booth for games?
A. train station B. cathedral C. metro station D. fairgrounds E. amusement park
Answer: *(A_1^1- COT)* The question mentions the keywords "buying tickets" and "games", so we can guess that this is a · · ·
(A_1^1) Therefore, the correct answer is **E. amusement park**
(PV) Thinking about the correctness of the previous answer· · ·
Thinking result: I am sure that the earlier answer is **correct**

Question: *(TaskP)* Please choose the most appropriate one from the following options:
(question) what contributes more, though less than some believe, to the lung damage caused by smoking?
A. smoking less B. switching to chewing C. no filters D. switching to e-cigs
(COTP) Please give the detailed solving process and *(SCP)* verify your response before final submission.
Answer: *(A_2^1-COT)* Smoking causes less lung damage than people think, but it's not completely without effect.
So the answer is **A. smoking less**
(NV) Thinking about the correctness of the previous answer · · ·
Thinking result: Sorry, there is an error in the previous answer.
(SC-COT) Let's analyze each option:
A. smoking less: The question clearly mentions that it contributes less than some people think,· · · · · ·
C. no filters: filters it contributes to lung damage, and to a lesser extent than some believe. Therefore, the no filter option meets the requirement.
(A_2^2) So the correct option is **C. no filter**.

Experiments

Main Results

⭐A noticeable enhancement in accuracy is observed across all models for the two given tasks

Base Models	OpenBookQA		CommonsenseQA	
	ACC-First	ACC	ACC-First	ACC
CuteGPT-7B	25.2	29.0 (+3.8)	23.2	28.9 (+3.7)
CuteGPT-13B	37.2	42.0 (+4.8)	35.6	37.9 (+2.3)
Llama2-7B	52.2	52.2 (+0.0)	52.2	52.3 (+0.1)
ChatGLM-6B	37.0	42.6 (**+5.6**)	34.3	38.7 (**+4.4**)
Vicuna-7B	28.6	28.80 (+0.4)	25.9	26.2 (+0.3)
Vicuna-13B	33.8	34.0 (+0.2)	32.4	32.6 (+0.3)

Quantitative Analysis

Base Models	Confidence	EvalACC	R2R	R2W	W2W	W2R
OpenBookQA						
CuteGPT-7B	70.6	36.6	9	20	78	39
CuteGPT-13B	40.8	52.0	57	54	57	78
Llama2-7B	99.6	**52.2**	0	0	2	0
ChatGLM-6B	60.4	27.2	34	31	76	59
Vicuna-7B	98.6	28.8	0	0	6	1
Vicuna-13B	97.2	34.2	1	4	4	5
CommonsenseQA						
CuteGPT-7B	87.7	26.8	10	6	83	51
CuteGPT-13B	42.2	**53.8**	111	131	111	159
Llama2-7B	99.8	52.3	0	0	4	2
ChatGLM-6B	52.7	52.3	70	92	272	146
Vicuna-7B	98.9	26.0	1	2	13	9
Vicuna-13B	97.5	33.1	5	5	13	8

Performance on New Task