

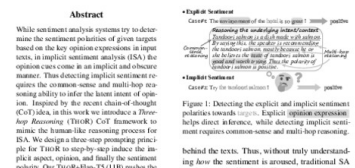
1. Reasoning Implicit Sentiment with Chain-of-Thought Prompting ❤️



Reasoning Implicit Sentiment with Chain-of-Thought Prompting

Hao Fei, Bobo Li, Qian Liu, Lidong Bing, Fei Li, Tat-Seng Chua. Proceedings of th...

📄 <https://aclanthology.org/2023.acl-short.101>



About Paper

1. Background & Problems

Explicit Sentiment Analysis (ESA) → the emotional expressions explicitly occur in texts.

Implicit Sentiment Analysis (ISA) → the inputs contain only factual description with no explicit opinion expression directly given.

Without understanding how the sentiment is aroused, traditional SA methods are ineffective to ISA.

2. Method

Introduce a **Three-hop Reasoning (THOR) CoT** framework to mimic the human-like reasoning process for ISA.

This paper consider mining the implicit aspect and opinion states → common-sense reasoning and multi-hop reasoning

Design a three-step prompting principle for THOR to step-by-step induce the implicit aspect, opinion, and finally the sentiment polarity.

3. Conclusion

Present a THOR prompting framework to achieve the CoT reasoning process for implicit sentiment analysis.

Design three prompts for three steps of reasoning: 1. fine-grained aspect; 2. underlying opinion; 3. final polarity.

Show that the larger LLMs, the more significant improvement by THOR method.

4. Limitations

While on the middle or lower size LLMs, the improvement by THOR will be limited to certain extent, due to the emergence nature of LLMs.

Analyze Paper

- CoT + LLM → Implicit Sentiment Analysis
- Creativity: 融合创新

My Thoughts

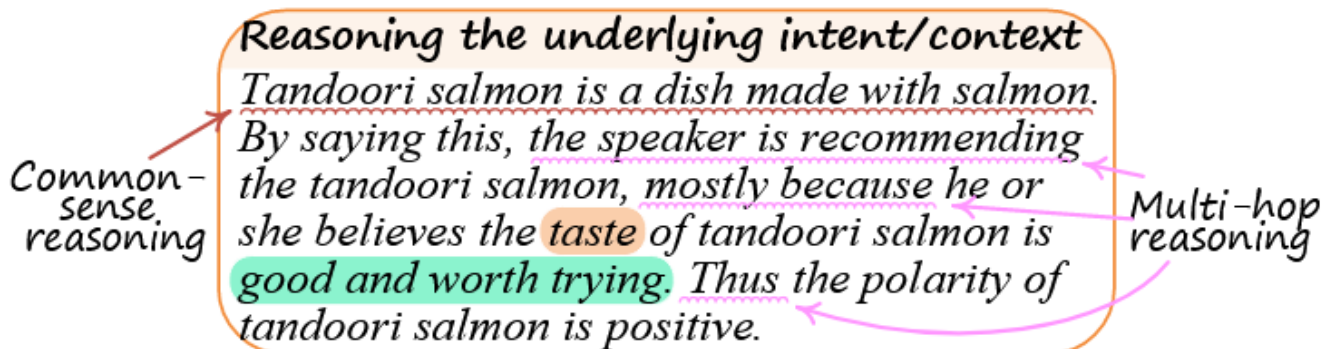
- CoT + LLM + PEFT → Sentiment Analysis

Pictures

Figure 1: Detecting the explicit and implicit sentiment polarities towards targets. Explicit opinion expression helps direct inference, while detecting implicit sentiment requires common-sense and multi-hop reasoning.

• Explicit Sentiment

Case#1: The environment of the hotel is so great! → positive

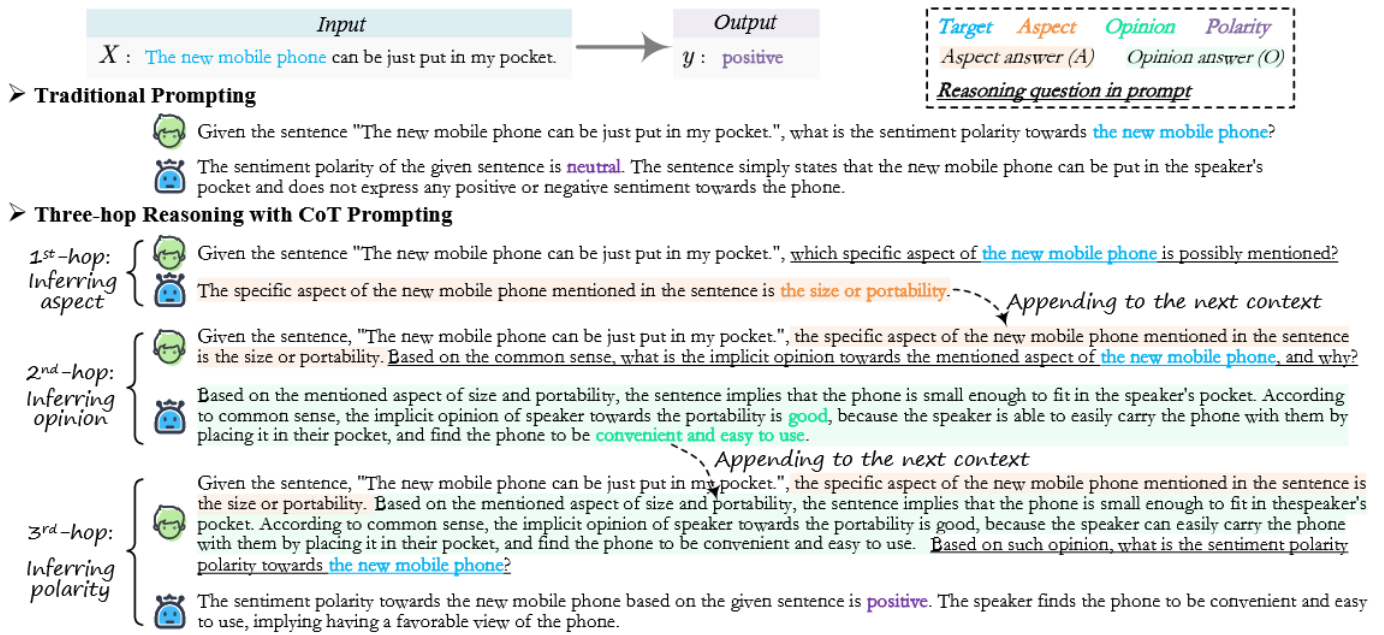


• Implicit Sentiment

Case#2: Try the tandoori salmon! → positive



Figure 2: An illustration of our THOR framework for three-hop reasoning of implicit sentiment



Note

Reasoning Implicit Sentiment with Chain-of-Thought Prompting

ACL 2023

read date: 2023.12.3

Conclusion: present a THOR prompting framework to achieve the CoT reasoning process for implicit sentiment analysis.

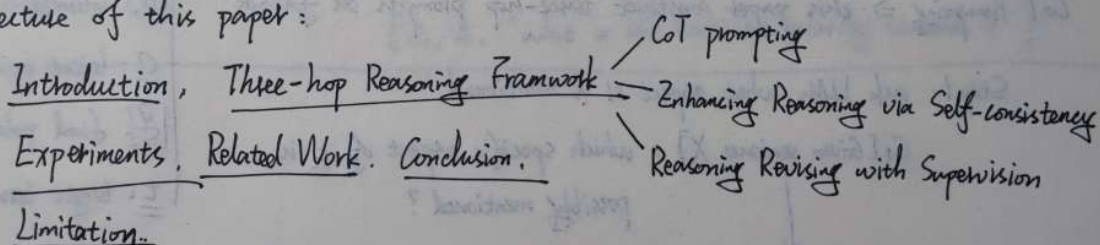
design three prompts for three steps of reasoning:

1° fine-grained aspect 2° underlying opinion 3° final polarity

show that the larger LLMs, the more significant improvement by THOR method.

Limitations: while on the middle or lower size of LLMs, the improvement by THOR will be limited to certain extent, 在一定程度上受到限制, due to the emergence nature of LLMs.

the architecture of this paper:



2023.12.5

Introduction

Sentiment Analysis (SA) → explicit SA (ESA) → the emotional expressions explicitly occur in texts.
→ implicit SA (ISA) → the inputs contain only factual descriptions with no explicit opinion expression directly given.

without understanding how the sentiment is aroused, traditional SA methods are ineffective to ISA.

this paper consider mining the implicit aspect and opinion states ⇒ $\left\{ \begin{array}{l} \text{common-sense reasoning} \\ \text{multi-hop reasoning} \end{array} \right.$

★ $\left\{ \begin{array}{l} \text{LLMs showing extraordinary ability on common-sense reasoning} \\ \text{the CoT ideas has revealed the great potential of LM's multi-hop reasoning.} \end{array} \right.$

this paper design 3 prompts for three steps of reasoning, each of which respectively infers:

- 1° the fine-grained aspect of the given target.
- 2° the underlying opinion towards the aspect
- 3° the final polarity.

this is the first attempt to successfully extend the CoT idea to the sentiment analysis community. It can broadly applied to other similar NLP problems without much effort.

Three-hop Reasoning Framework

~~CoT Prompting~~ \Rightarrow $\left. \begin{array}{l} 1^{\text{st}}\text{-hop: inferring aspect} \\ 2^{\text{nd}}\text{-hop: inferring opinion} \\ 3^{\text{rd}}\text{-hop: inferring polarity} \end{array} \right\}$ THOR framework for three-hop reasoning of implicit sentiment.

CoT Prompting \Rightarrow this paper construct three-hop prompts as follows

Step 1: ask LLMs what aspect α is mentioned.

$C_1[\text{Given sentence } X]:$ which specific aspect of \underline{t} is possibly mentioned?

\downarrow
it is the first-hop prompt context.

$\star A = \arg\max P(\alpha | X, \underline{t}) \rightarrow A$ is the output text which explicitly mentions the aspect α .

Step 2: based on X, \underline{t}, α , we ask LLM to answer in detail what would be the underlying opinion \underline{o} towards the mentioned aspect α .

$C_2[C_1, A]:$ based on the common sense, what is the implicit opinion and why?

\downarrow
it is the second-hop prompt context

$\star O = \arg\max P(\underline{o} | X, \underline{t}, \alpha) \rightarrow O$ is the answer text containing the possible opinion expression \underline{o} .

Step 3: with the complete sentiment skeleton $(X, \underline{t}, A(\alpha), \underline{o})$ as context, ask LLM to infer the final answer of polarity \underline{y} .

$C_3[C_2, O] \rightarrow$ it is the third-hop prompt context.

$\star \underline{y} = \arg\max P(\underline{y} | X, \underline{t}, \alpha, \underline{o})$

α : intermediate aspect term
 \underline{o} : latent opinion
 \underline{y} : final polarity.
 \underline{t} : target term, $\underline{t} \subset X$

Enhancing Reasoning via Self-consistency.

this paper leverage the self-consistency mechanism to consolidate the reasoning correctness.

for each of three reasoning steps, this paper set the LLM decoder to generate multiple answers, each of which will likely to give varied predictions of α , β , γ .

select the one with highest confidence as the context in next step.

Reasoning Revising with Supervision

at each step, construct a prompt by concatenating

- initial context
- this step's reasoning answer text
- final question

feed it into LLM to predict the sentiment label, instead of going to the next step reasoning.

(e.g.) at the end of step-1, we can assemble a prompt:

[C_1 , A , "what is the sentiment polarity towards t "]

