


AgentInstruct: Agent Instructs Large Language Models to be General Zero-Shot Reasoners

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Large Language Models

OpenAI

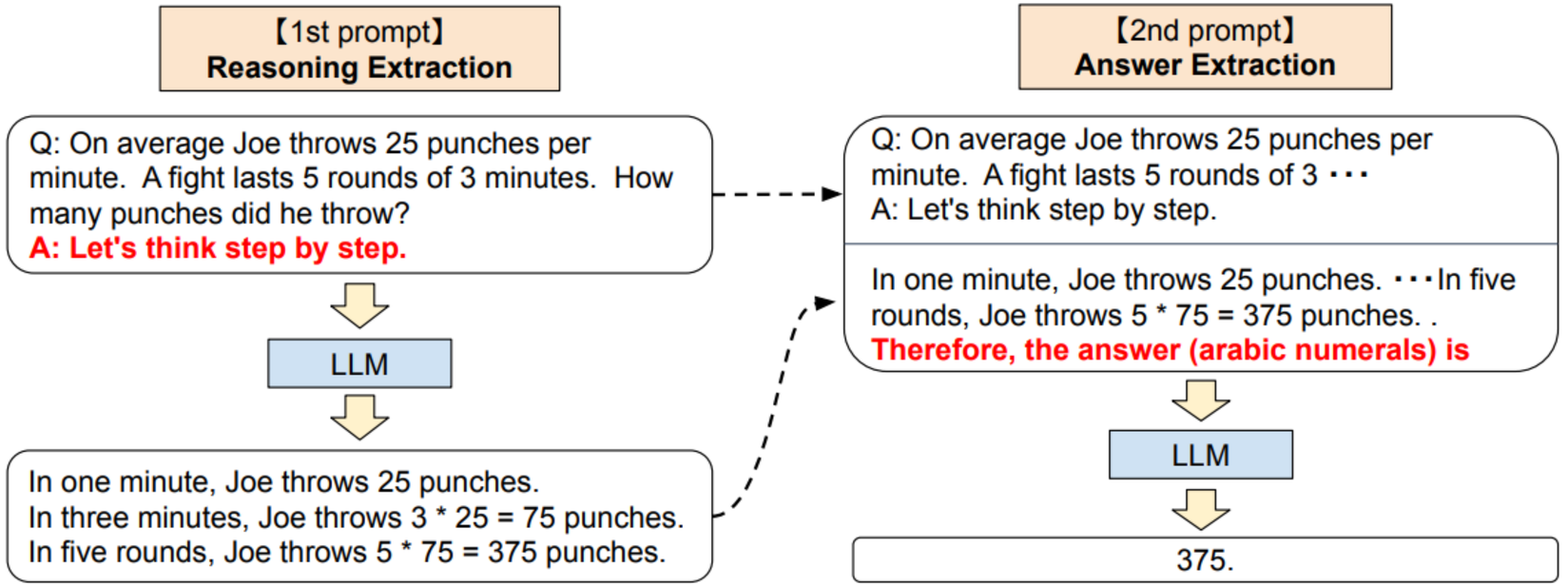
GPT - 4





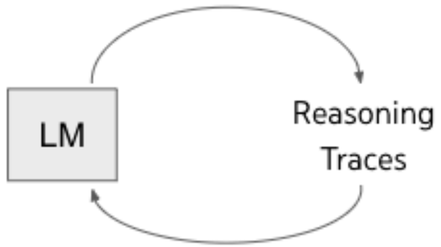
Large language models exhibit advanced performance on language understanding tasks

Zero-Shot Reasoning

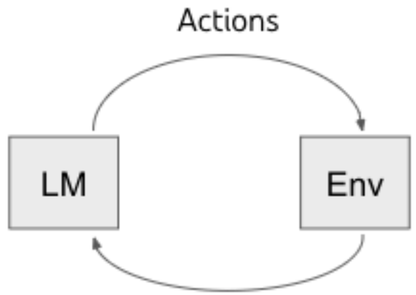


Zero-shot reasoning methodologies have proven useful for specific task domains

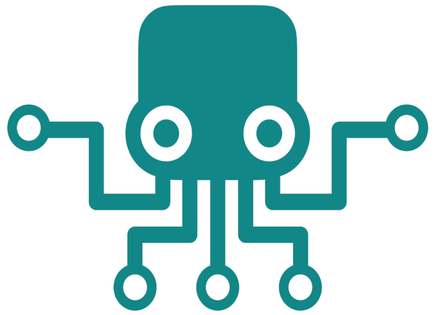
Language Models as Agents



Reason Only



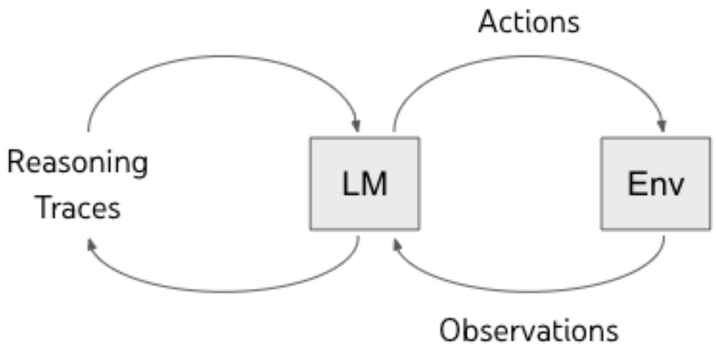
Act Only



AutoGPT



LangChain



ReAct (Reason + Act)



AutoGen

Agents utilize planning to accomplish more complex tasks

Zero-Shot AgentInstruct: Overview

Zero-Shot

Passage: Alan Rickman & Emma Thompson give good performances with southern/New Orleans accents in this detective flick. It's worth seeing for their scenes- and Rickman's scene with Hal Holbrook.

These three actors mannage to entertain us no matter what the movie, it seems. The plot for the movie shows potential, but one gets the impression in watching the film that it was not pulled off as well as it could have been.

The fact that it is cluttered by a rather uninteresting subplot and mostly uninteresting kidnappers really muddles things.

The movie is worth a view- if for nothing more than entertaining performances by Rickman, Thompson, and Holbrook.

Sentiment: **Positive** ✗

Zero-Shot CoT

Passage: Alan Rickman & Emma Thompson...
Let's think step by step.

...What is the author's conclusion?

The author concludes that the movie is worth a view, mainly for the entertaining performances of the three main actors, despite some flaws in the plot.

Therefore, the correct label among {'Negative', 'Positive'} (just the label) to the original task is below.

Sentiment: **Positive** ✗

Zero-Shot AgentInstruct

Task Information
Name: *IMDB*; Labels: *Positive, Negative*; Input Examples: *"Passage: ..."*

↓

Agent

↓

Agent Instructions

Instructions:
1. Understand the Dataset: The IMDB Movie Reviews dataset contains 50,000 reviews... These reviews are labeled as either positive or negative...
2. Analyze the Passage: Pay attention to the language, the tone of the review, and any explicit or implicit expressions of sentiment towards the movie...

Chain of Thought (CoT) Reasoning

Passage: Alan Rickman & Emma Thompson...
Follow the instructions...

The passage provides a mixed assessment of the movie, praises the performances of Alan Rickman, Emma Thompson, and Hal Holbrook but also expresses disappointment... the reviewer's use of language and tone suggests that they are leaning towards a negative sentiment...

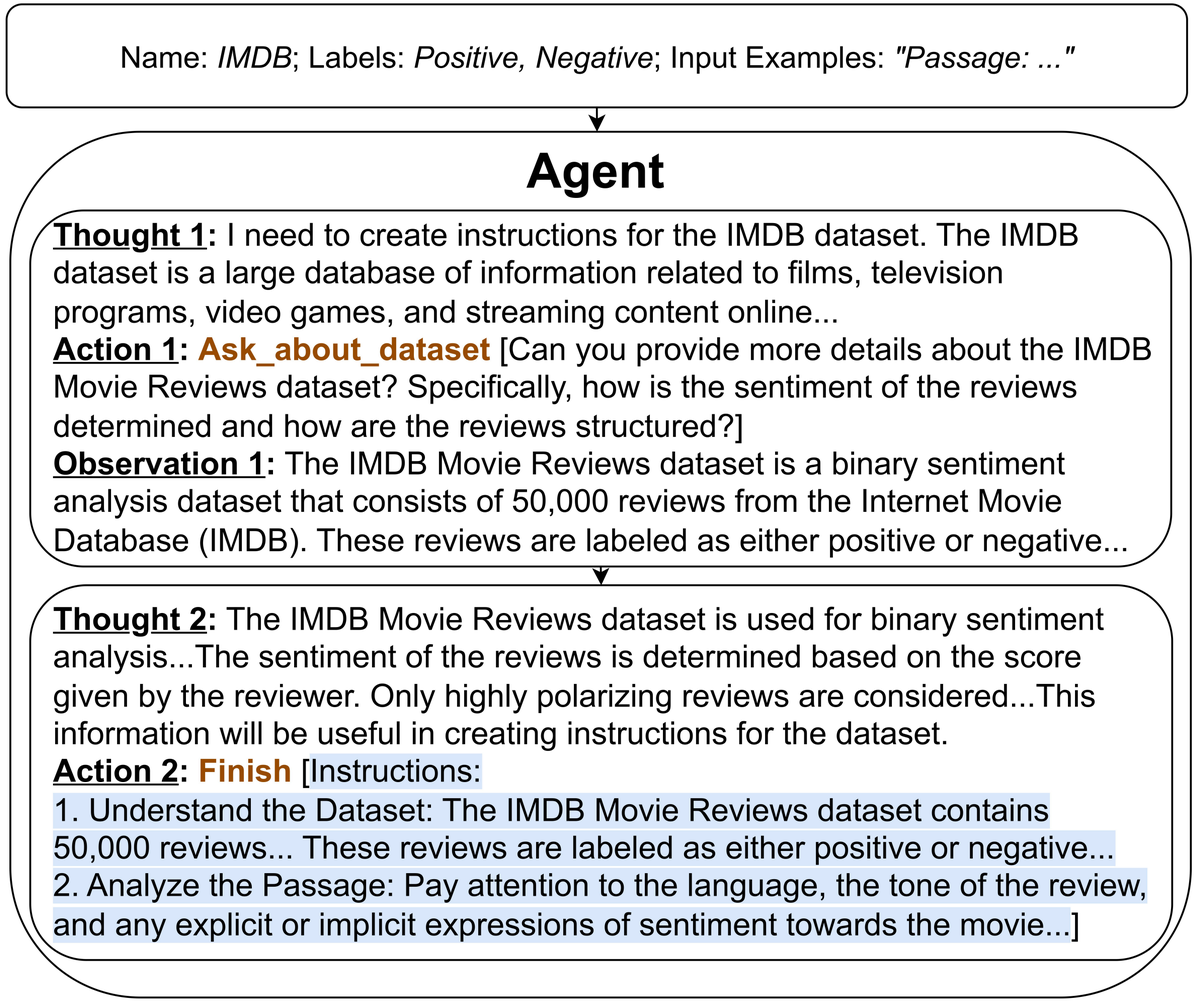
Additionally, the reviewer mentions that the movie is "worth a view" only for the performances of the three actors, implying that the movie itself is not particularly noteworthy.

Therefore, the correct label among {'Negative', 'Positive'} (just the label) to the original task is below.

Sentiment: **Negative** ✓

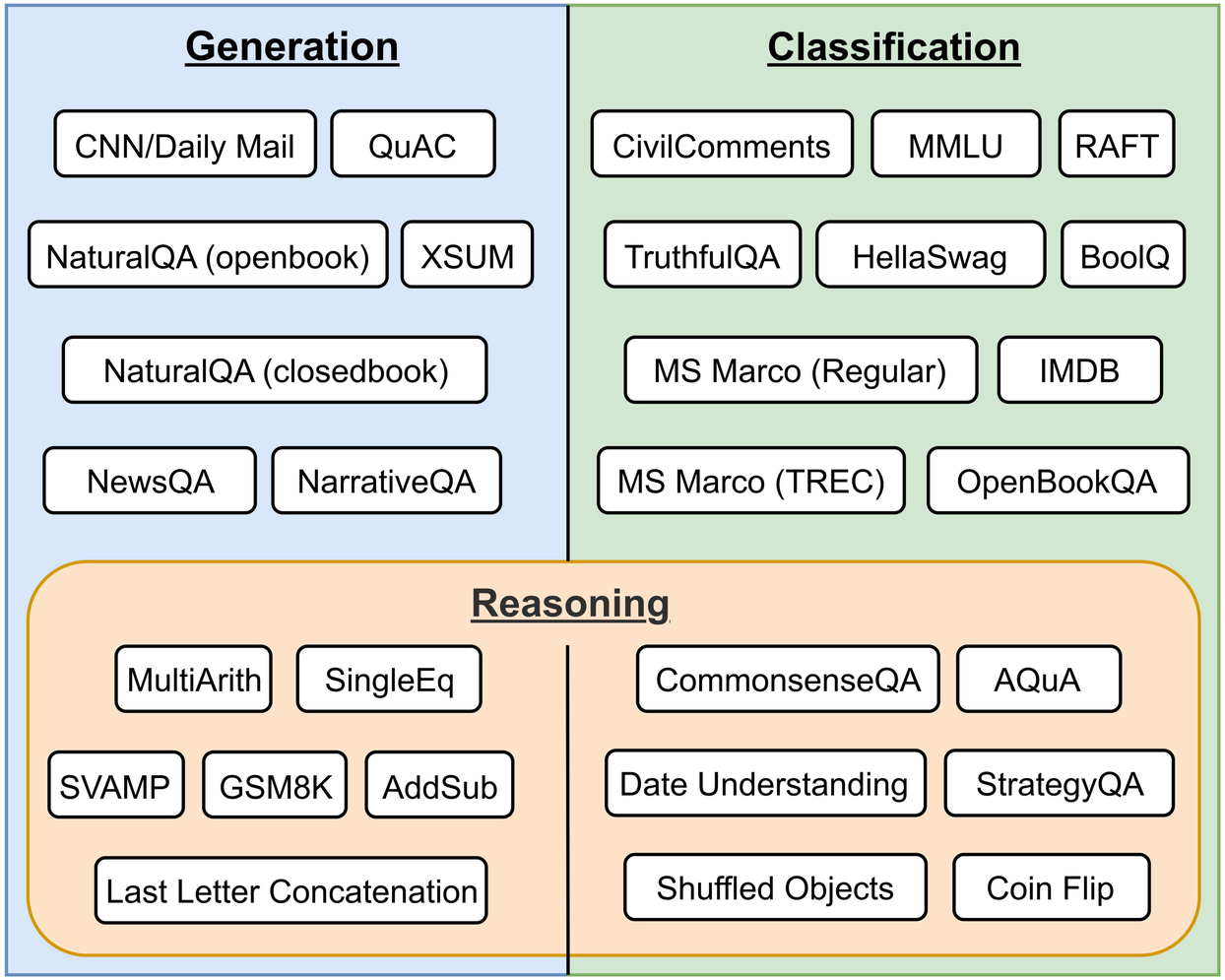
Our agent produces task-specific instructions to instruct the reasoning process of LLMs

Zero-Shot AgentInstruct: Agent Instructions



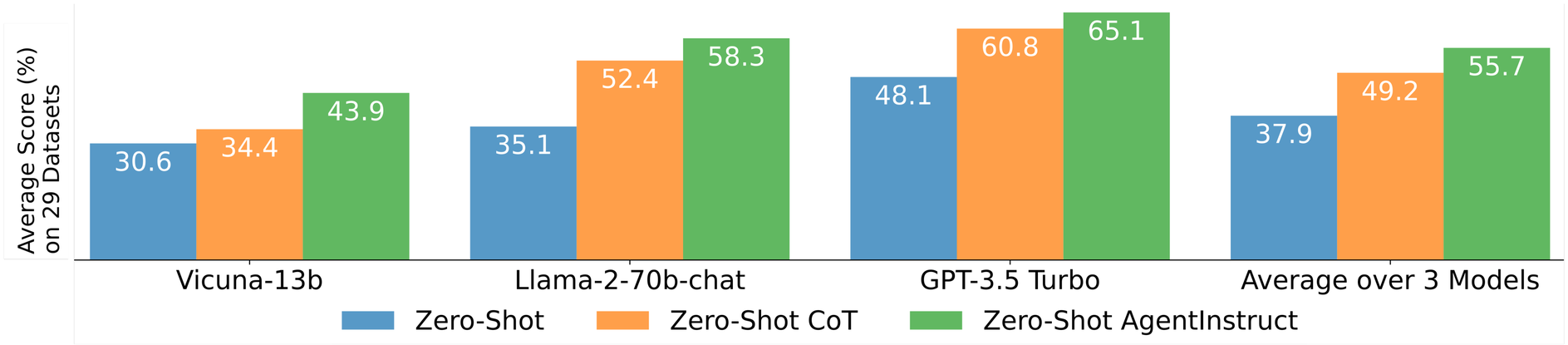
An example of our agent creating task-specific instructions for the IMDB dataset

Datasets



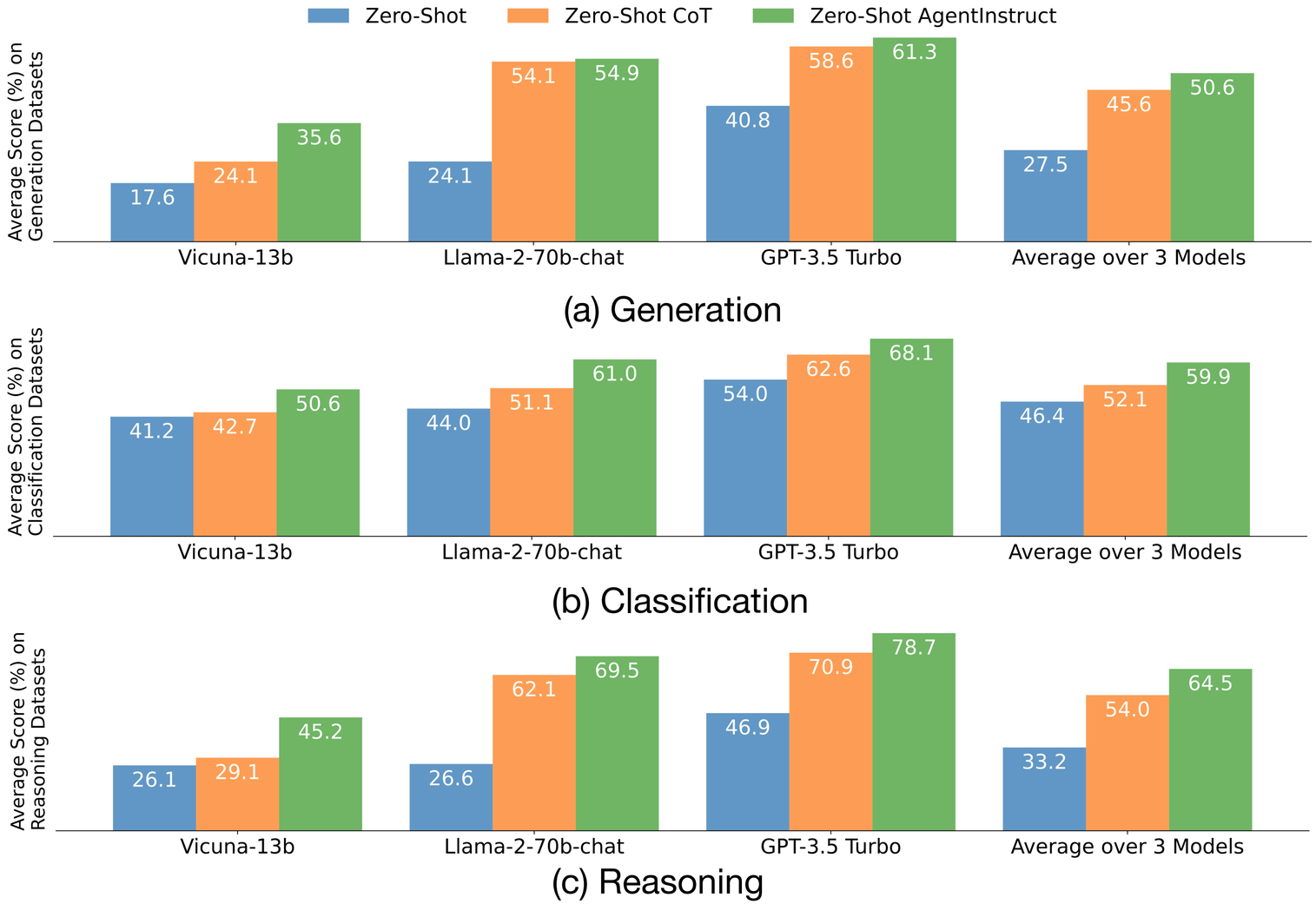
We evaluated our method on 29 datasets spanning generation, classification, and reasoning

Results



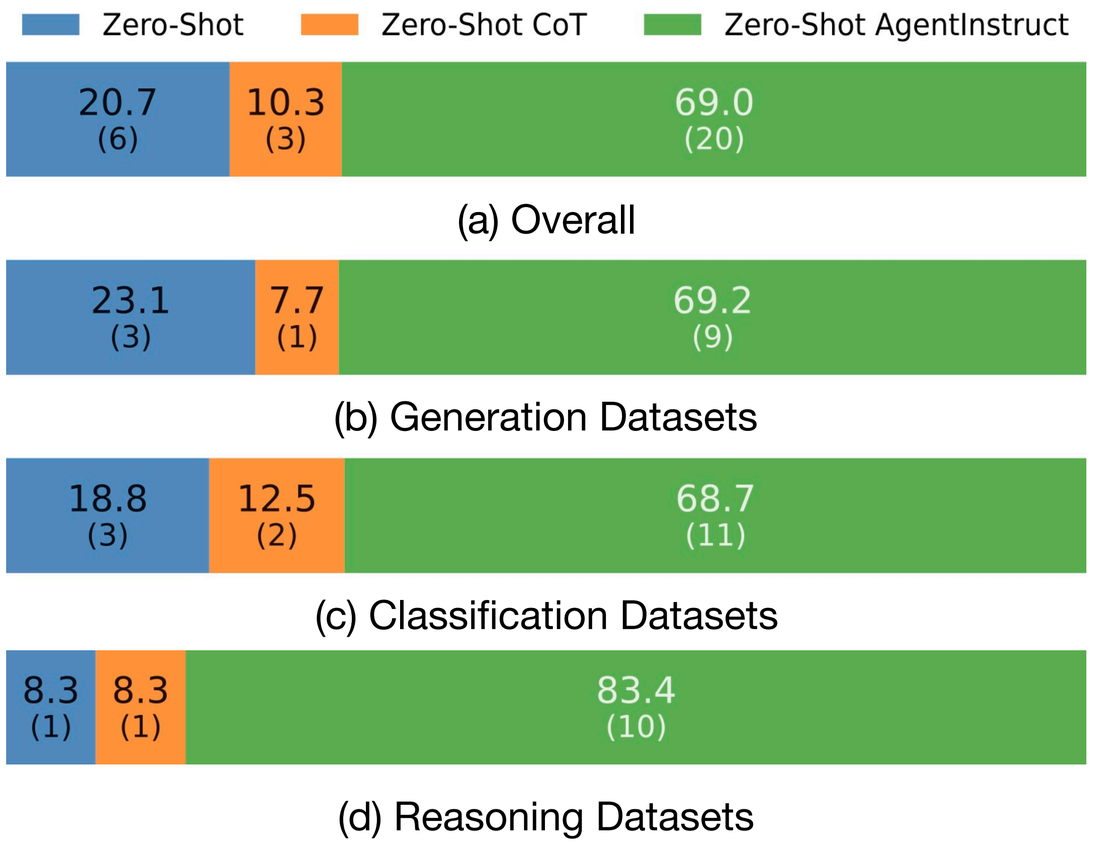
Zero-shot AgentInstruct shows a significant improvement over all 29 datasets on average

Results



Zero-shot AgentInstruct shows an improvement on each category of tasks, especially reasoning

Results



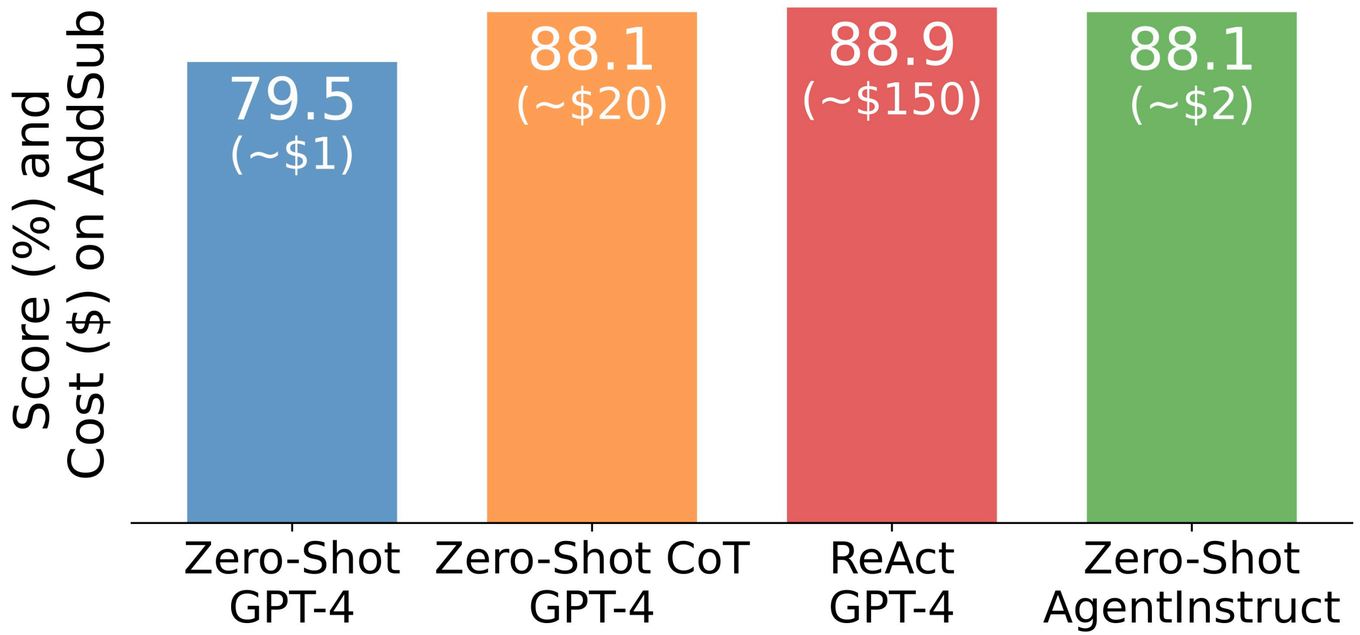
Zero-shot AgentInstruct achieves SoTA results on 20 of the 29 datasets

Ablation

	AddSub	IMDB	NarrativeQA
Zero-Shot AgentInstruct	**79.5**	**94.0**	**65.0**
w/o Agent Instructions	73.2	89.0	62.3
w/o Input Examples	72.4	88.0	60.1
w/o Labels	74.9	93.8	63.9
w/o GPT-4	75.2	92.6	63.5

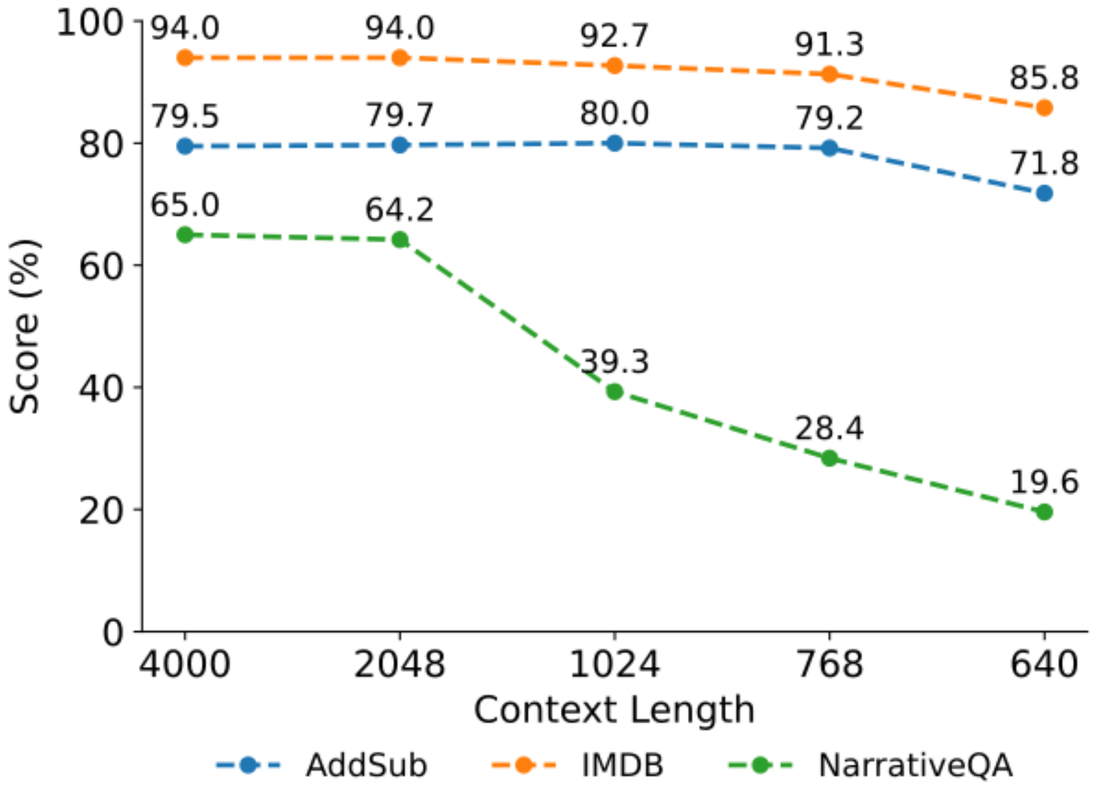
All components of zero-shot AgentInstruct are important

Comparison on GPT-4



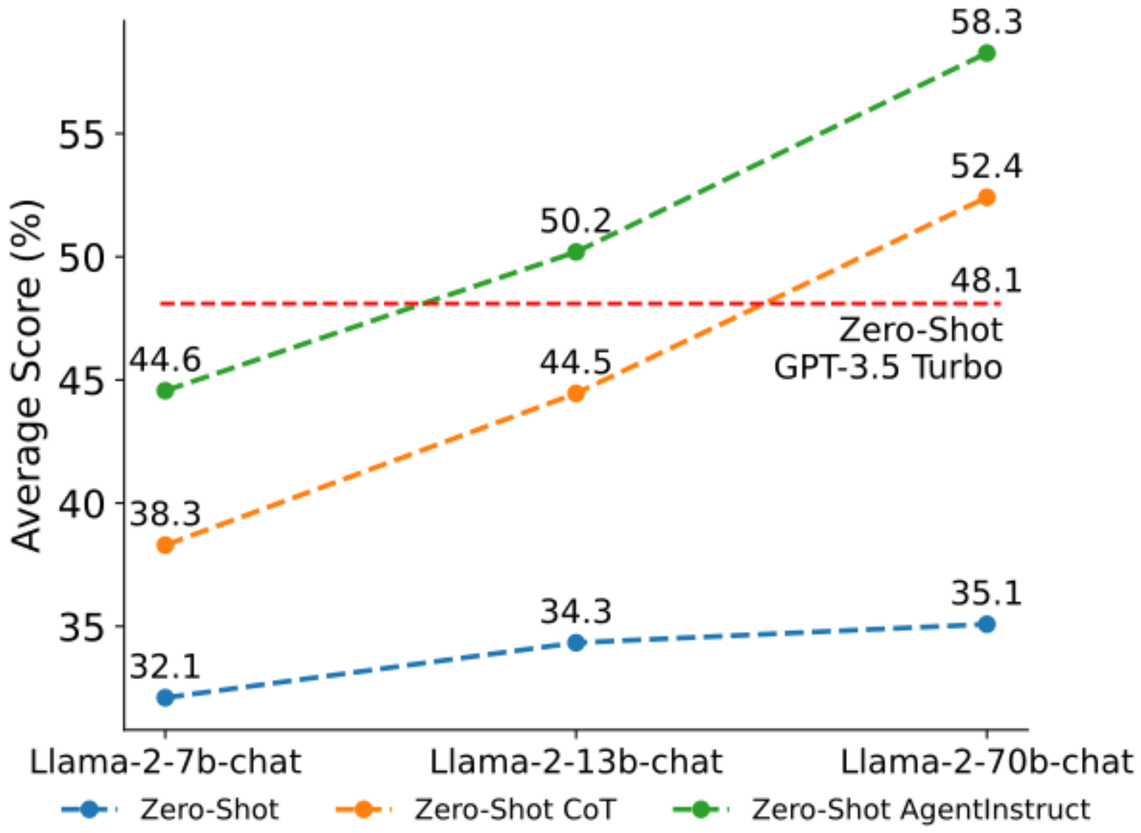
Zero-shot AgentInstruct is a cost-effective alternative to using agents directly

Context Length



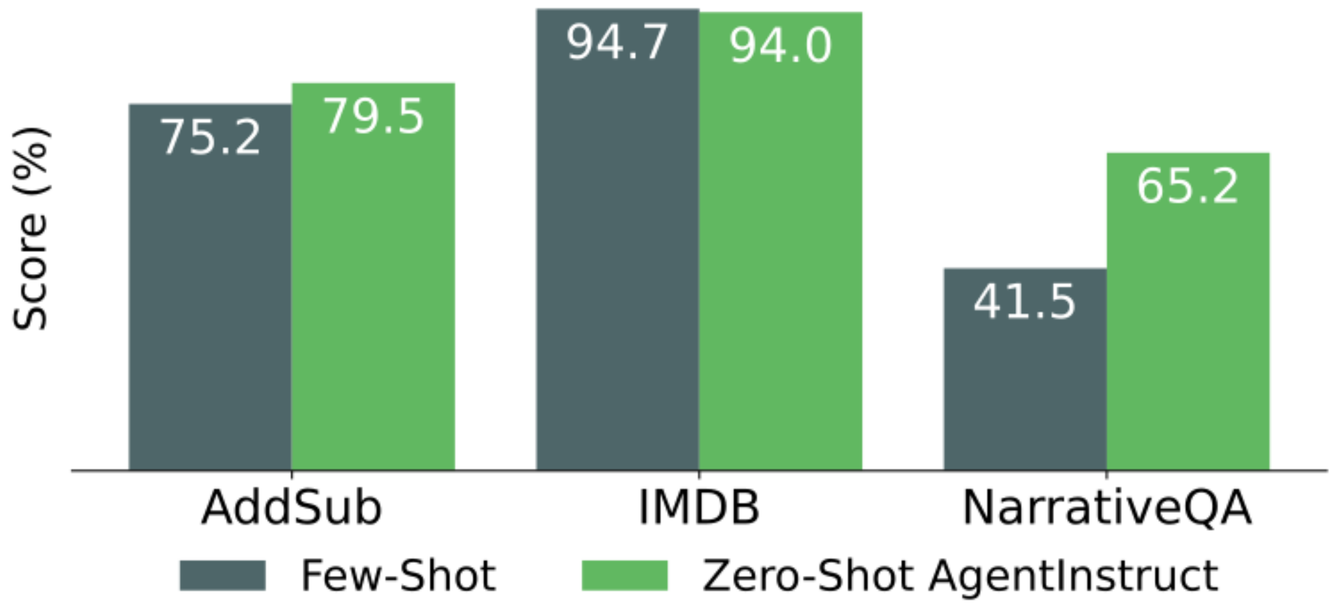
Zero-shot AgentInstruct is sensitive to the context window

Scaling



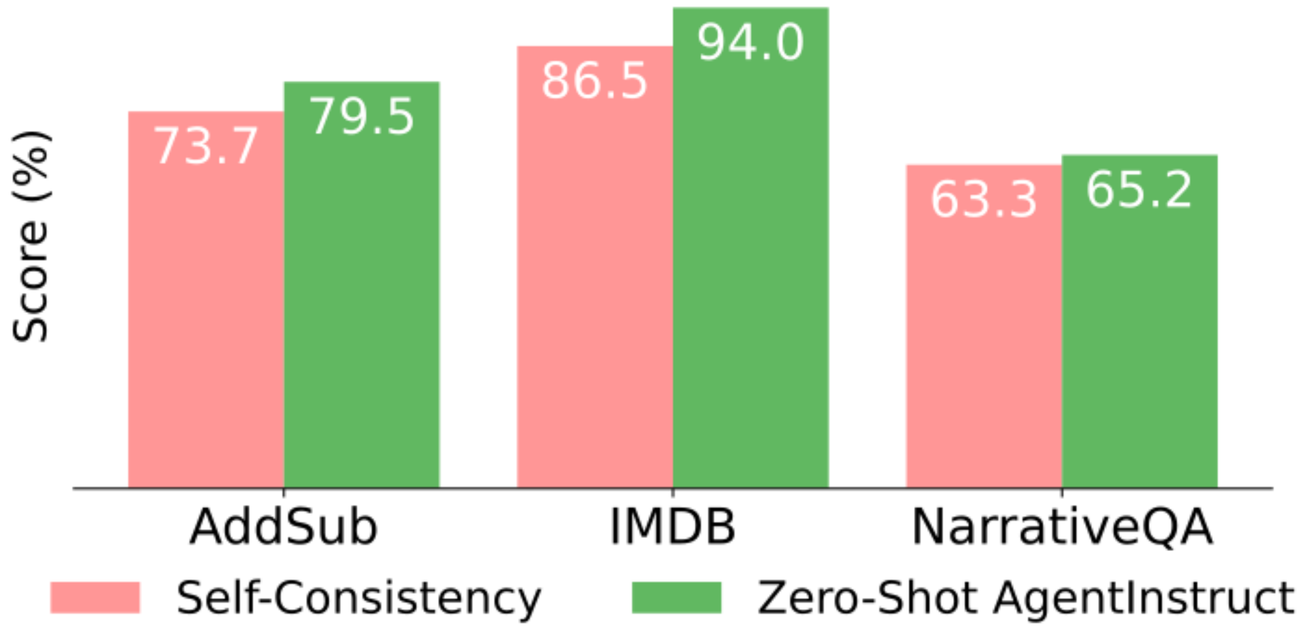
Llama-2-70b-chat with Zero-shot AgentInstruct outperforms zero-shot ChatGPT by 10.2%

Comparison Methods: Few-Shot



Zero-shot AgentInstruct performs near the level of few-shot prompting

Comparison Methods: Self-Consistency



Zero-shot AgentInstruct exceeds the performance of self-consistency

Conclusion

- Zero-Shot AgentInstruct: Combine an autonomous agent generating instructions with CoT reasoning
- AgentInstruct outperforms zero-shot and zero-shot CoT on generation, classification, and reasoning tasks
- State-of-the-art on 20 of 29 datasets
- Code: https://github.com/wang-research-lab/agentinstruct

