

Prompt Engineering

By Sarath Chandra

Sarath Chandra, Thu 11 Jan 2024

Evolution of NLP pipelines

Problem
Definition

Data
Collection

Data
Annotation

Model
Creation

Model
Training

Before Transformers
RNNs, LSTMs

Problem
Definition

Data
Collection

Data
Annotation

Pre-trained Model

Fine
Tuning

After Transformers
BERT, RoBERTa, T5

Problem
Definition

Large Language Model

Prompting

After LLMs

ChatGPT, LLaMA2, Mixtral, Gemini

Zero Shot Prompting

Just give your task description & input if any!

SA You
Identify all the named entities from the below passage

Vivekananda was one of the most influential philosophers and social reformers in his contemporary India, and the most successful missionaries of Vedanta to the Western world. He was also a major force in contemporary Hindu reform movements and contributed to the concept of nationalism in colonial India.

ChatGPT
Named entities in the passage:

1. **Vivekananda** - Person
2. **India** - Location
3. **Vedanta** - Concept/Philosophy
4. **Western world** - General location
5. **Hindu** - Religion
6. **nationalism** - Concept
7. **colonial India** - Historical context

SA You
Classify the text into neutral, negative or positive.
Text: I think the vacation is okay.
Sentiment:

ChatGPT
The sentiment of the text "I think the vacation is okay" is neutral.

Sentiment Analysis

Few Shot Prompting

Give some examples for your task

Few-shot Prompt

Classify these conversations:

Text: My service was awesome.

Label: positive ✓

Text: My order never arrived.

Label: positive ✗

Text: Thanks for great service!

Label: positive ✓

Text: Horrible customer service!

Label: ←



positive ✗

Chain-of-Thought

Lets think step by step

(a) Few-shot

Q: Roger has 5 tennis balls. He buys 2 more cans of tennis balls. Each can has 3 tennis balls. How many tennis balls does he have now?

A: The answer is 11.

Q: A juggler can juggle 16 balls. Half of the balls are golf balls, and half of the golf balls are blue. How many blue golf balls are there?

A:

(Output) The answer is 8. X

(b) Few-shot-CoT

Q: Roger has 5 tennis balls. He buys 2 more cans of tennis balls. Each can has 3 tennis balls. How many tennis balls does he have now?

A: Roger started with 5 balls. 2 cans of 3 tennis balls each is 6 tennis balls. $5 + 6 = 11$. The answer is 11.

Q: A juggler can juggle 16 balls. Half of the balls are golf balls, and half of the golf balls are blue. How many blue golf balls are there?

A:

(Output) The juggler can juggle 16 balls. Half of the balls are golf balls. So there are $16 / 2 = 8$ golf balls. Half of the golf balls are blue. So there are $8 / 2 = 4$ blue golf balls. The answer is 4. ✓

(c) Zero-shot

Q: A juggler can juggle 16 balls. Half of the balls are golf balls, and half of the golf balls are blue. How many blue golf balls are there?

A: The answer (arabic numerals) is

(Output) 8 X

(d) Zero-shot-CoT (Ours)

Q: A juggler can juggle 16 balls. Half of the balls are golf balls, and half of the golf balls are blue. How many blue golf balls are there?

A: Let's think step by step.

(Output) There are 16 balls in total. Half of the balls are golf balls. That means that there are 8 golf balls. Half of the golf balls are blue. That means that there are 4 blue golf balls. ✓

- Giving the model some more **context allowing it to think!**

- Enables complex reasoning capabilities through **intermediate reasoning steps**

- **XOT type Prompting Techniques!**

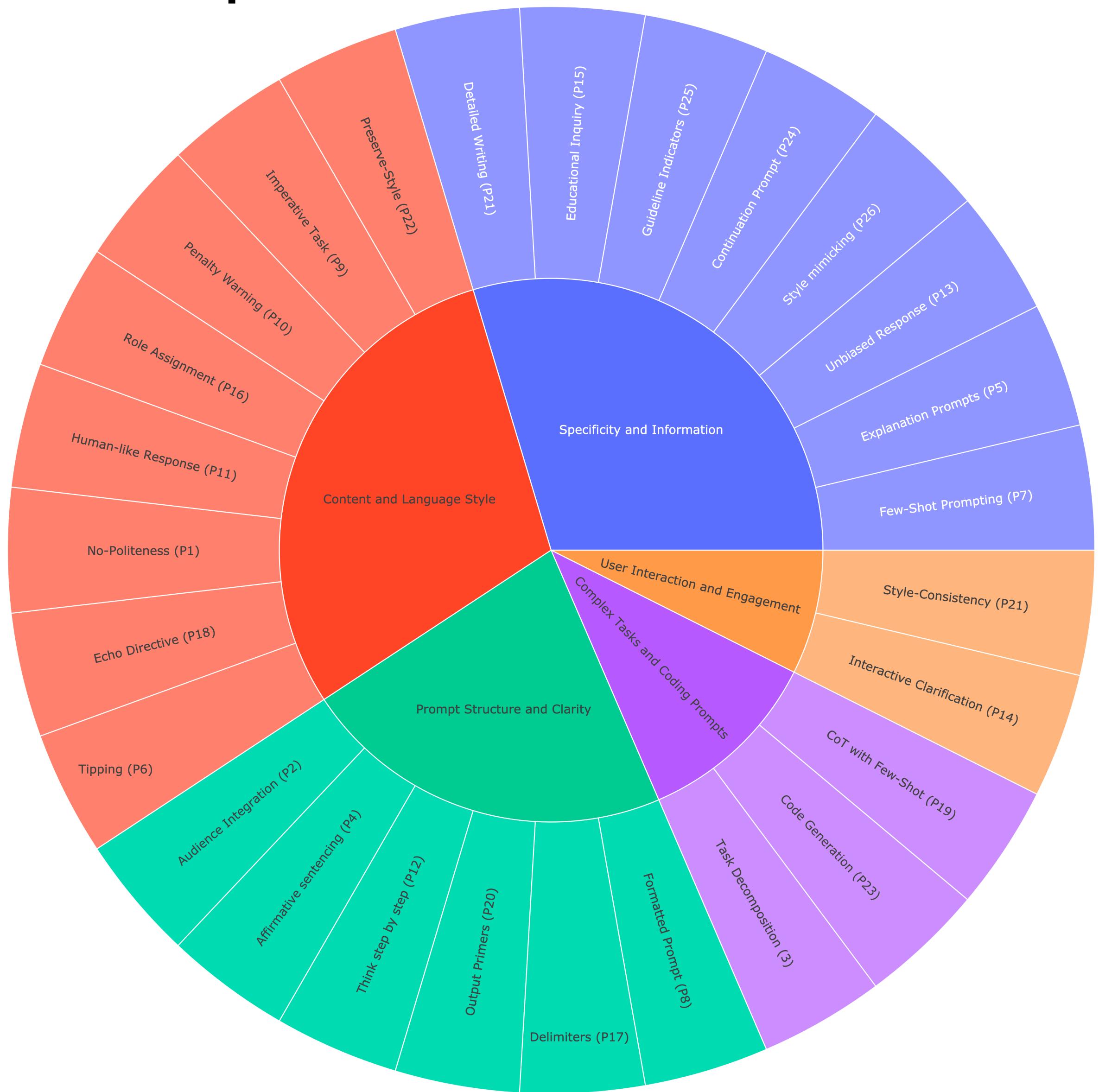
- **Tree of Thought**

- **Graph of Thought**

- **ReAct Prompting**

26 Prompt Principles

Principled Instructions Are All You Need for Questioning LLaMA-1/2, GPT-3.5/4 - 26 Dec 2023



- <https://github.com/VILA-Lab/ATLAS/blob/main/data/README.md>
- <https://browse.arxiv.org/html/2312.16171v1#:~:text=Overview%20of%2026%20prompt%20principles.>
- <https://arxiv.org/abs/2312.16171>

Results

Boosting: stable 50% improvement across different LLMs

Correctness: the **larger** the **model**, the greater the increase in correctness

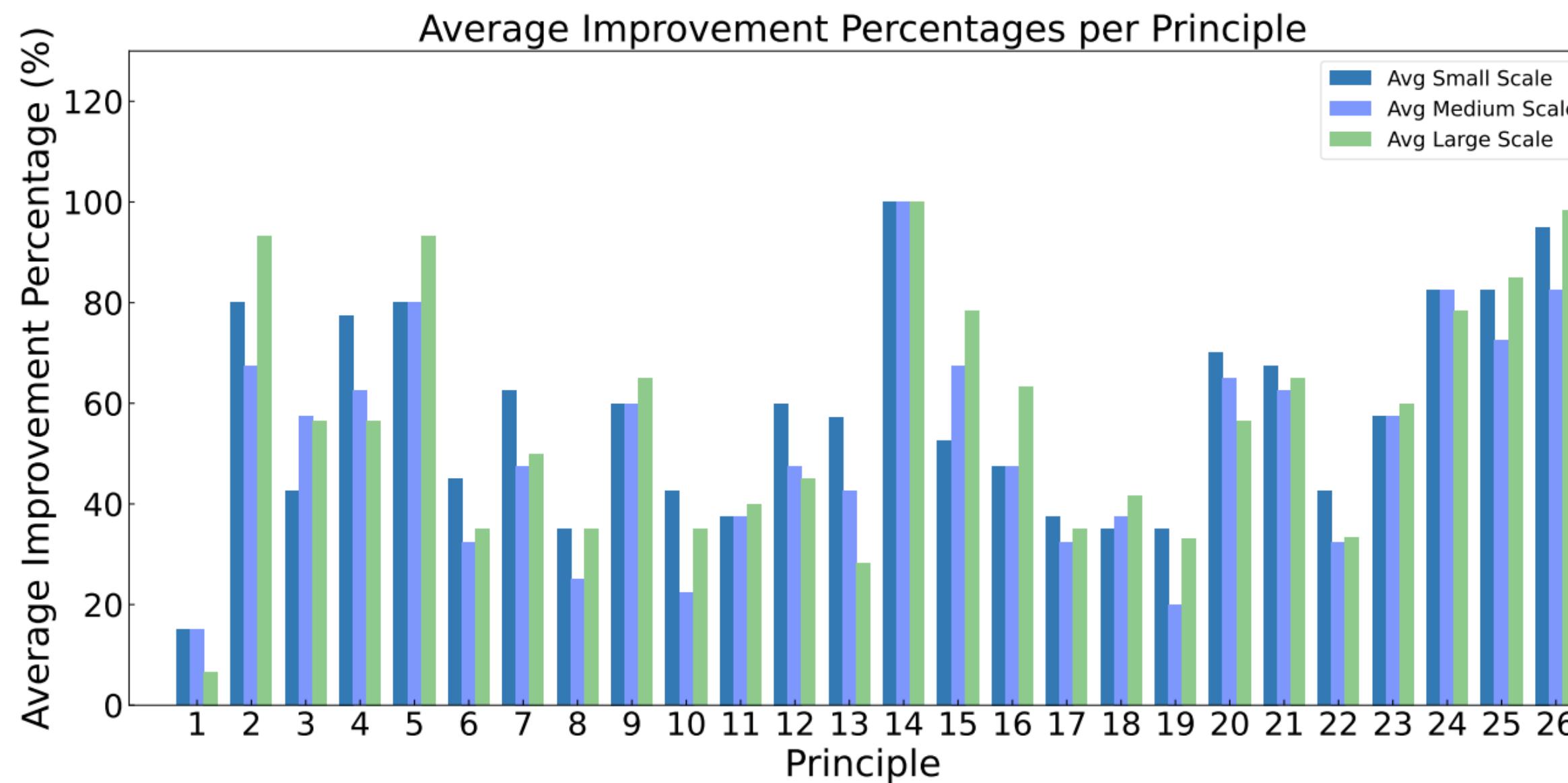


Figure 4: Boosting of LLM response quality after employing the introduced principles on prompts. *small-scale* indicates the 7B models, *medium-scale* indicates the 13B models and *large-scale* indicates the 70B and GPT-3.5/4 models.

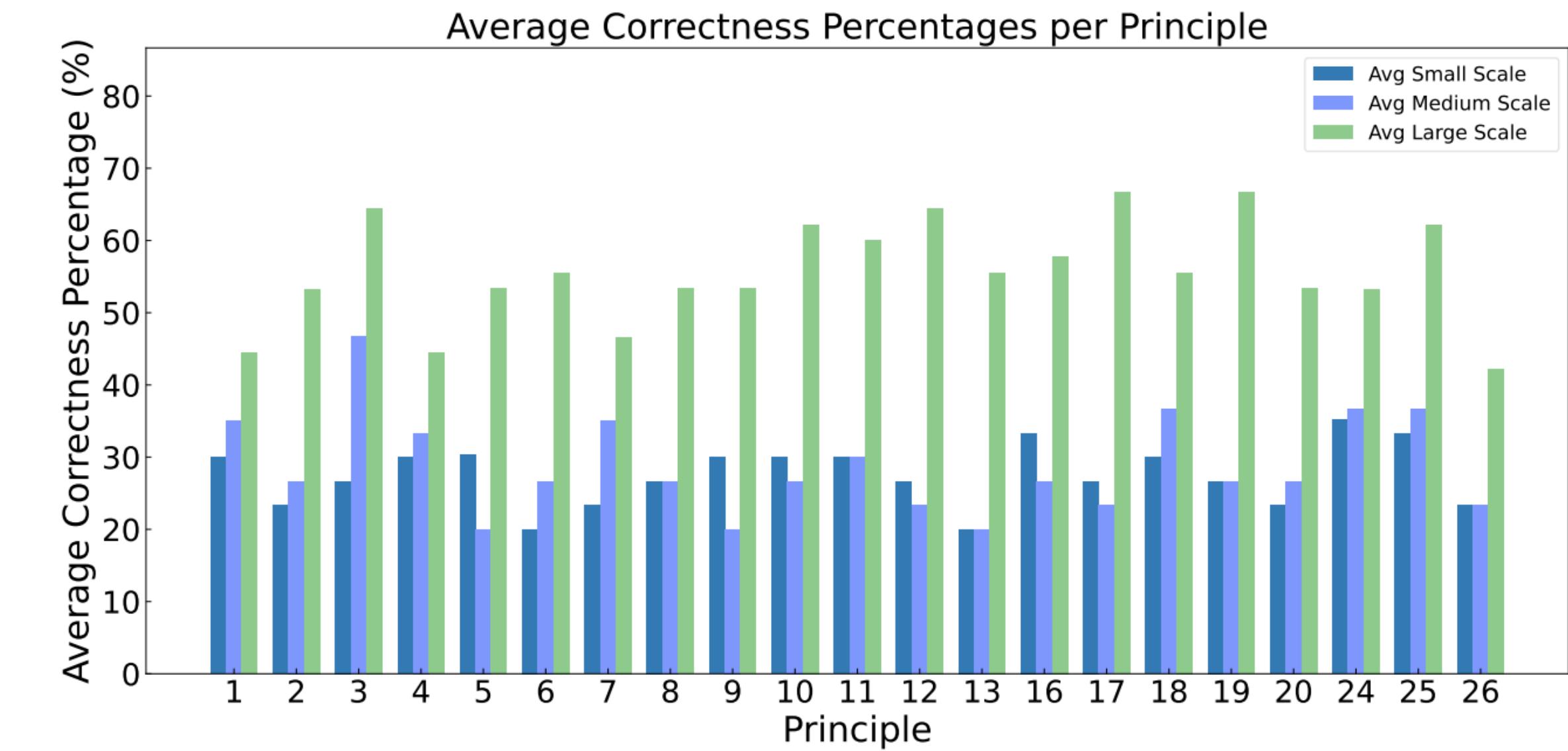


Figure 5: Correctness improvement of LLM response quality after employing the introduced principles on prompts. *small-scale* indicates the 7B models, *medium-scale* indicates the 13B models and *large-scale* indicates the 70B and GPT-3.5/4 models.

Correctness & Boosting Examples

Human (without principle):

How many words are in the following sentence: "She plays football"?

LLaMA-2-7B: 5



Human (with principle):

Find the number of words based on the following examples:

1. Ahmed takes care of his appearance; the number of words: 6
2. She went to school; the number of words: 4
3. he eats an apple; number of words: 4
4. Reem plays basketball; number of words : 3

Q: He plays football; the number of words?

LLaMA-2-7B: 3



Figure 10: Correctness improvement on small-scale LLaMA-2-7B model after using the introduced principle on prompts.

Human (without principle):

Explain the concept of climate change and its potential effects on the environment in one short paragraph.

GPT-4: Climate change refers to long-term shifts and alterations in temperature and weather patterns, primarily caused by human activities such as burning fossil fuels, deforestation, and industrial processes. Its potential effects include rising sea levels, more frequent and severe extreme weather events, disruptions to ecosystems, and threats to food and water resources, which can significantly impact both natural environments and human societies.

Human (with principle):

Explain the concept of climate change and its potential effects on the environment in one small paragraph.
Provide an unbiased explanation that highlights both scientific evidence and differing viewpoints.

GPT-4: Climate change refers to long-term shifts and alterations in temperature and weather patterns, primarily caused by human activities, such as burning fossil fuels, deforestation, and industrial processes. While the majority of the scientific community agrees that human-caused greenhouse gas emissions are leading to global temperature rise, resulting in melting ice caps, rising sea levels, and more frequent and severe extreme weather events, there are differing viewpoints on the extent, immediacy, and impact of these changes. Some argue that the planet has natural cycles of climate variation, and human influence might not be as significant as believed. Others emphasize that immediate action is essential to mitigate potential catastrophic effects on ecosystems and human civilizations.



Figure 2: Boosting example of LLM response after using the principle 13 on prompts.

Future of Prompt Engineering

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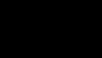
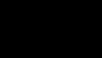
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The hottest new programming language is English

694  4.3K  27K  3.5M  1.1M  

Prompt Engineering we have seen today!

Is just the tip of an Iceberg



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