

Task 1: Advanced Prompt Engineering Techniques

Introduction

Prompt engineering is a technique used to effectively interact with large language models (LLMs) like ChatGPT, GPT-4, Claude, and others. It involves designing prompts (inputs) in such a way that the model understands the task clearly and provides accurate, relevant, and useful responses.

As AI models become more powerful, mastering advanced prompting techniques becomes essential—especially for tasks involving reasoning, creativity, or decision-making. The three most commonly used advanced techniques are Zero-Shot Prompting, Few-Shot Prompting, and Chain-of-Thought Prompting.

1. Zero-Shot Prompting

Zero-shot prompting refers to a method where the model is given only the task instruction, without any examples. It relies entirely on the model's prior training to interpret and respond appropriately.

How it works:

The prompt includes a clear instruction or question. Since no examples are given, it tests the model's general understanding of the task.

Example:

Prompt: "Translate the sentence 'How are you?' into French."

Output: "Comment ça va ?"

Applications:

- Language translation
- Fact-based question answering
- Text summarization
- Sentiment analysis
- Simple chatbot responses

Advantages:

- Saves time by avoiding the need to craft examples
- Useful for straightforward tasks

Limitations:

- May not work well for tasks requiring specific formats or styles
- Accuracy can decrease if instructions are vague

2. Few-Shot Prompting

Few-shot prompting involves providing the AI model with a few examples (typically 2–5) before giving the actual task. This helps the model better understand the expected pattern or format of the response.

How it works:

Each example consists of an input and the expected output. After a few of these, a new input is given, and the model attempts to generate an output based on the pattern.

Example:

Prompt:

css
CopyEdit
Translate English to Spanish:
Hello → Hola
Good night → Buenas noches
Thank you →

Output: Gracias

Applications :

- Code generation (e.g., from comments to code)
- Grammar correction
- Style imitation (e.g., writing in a formal or humorous tone)
- Classification tasks

Advantages:

- Provides context and sets expectations for the model
- More accurate than zero-shot for complex or ambiguous tasks

Limitations:

- Requires extra effort to craft good examples
- Prompt length is limited due to model input size restrictions

3. Chain-of-Thought (CoT) Prompting

Chain-of-Thought Prompting guides the AI to reason step-by-step before producing the final answer. This technique is especially useful for problems that require logic, computation, or reasoning.

How it works:

Instead of asking directly for the answer, the prompt encourages the model to break the problem into smaller steps and walk through the solution.

Example:

Prompt:

"If a train travels at 60 km/h for 3 hours, how far does it go? Let's think step by step."

Output:

"Speed = 60 km/h
Time = 3 hours
Distance = Speed × Time = $60 \times 3 = 180$ km
Answer: 180 km"

Applications:

- Math and physics problems
- Puzzle solving
- Legal or policy reasoning
- Medical diagnostics
- Scientific explanations

Advantages:

- Increases accuracy in complex tasks
- Makes the reasoning process transparent and traceable

Limitations:

- Can be slower and wordier
- May lead to over-explaining for simple tasks

Conclusion

Advanced prompt engineering techniques like Zero-Shot, Few-Shot, and Chain-of-Thought prompting enhance the way we interact with AI. They allow users to fine-tune the model's behavior and improve output quality depending on the task at hand. As AI continues to grow in capability, understanding and applying these techniques will become increasingly important in fields such as education, research, healthcare, customer support, and more.

Task 2 : Prompt Design Experiment

Topic Chosen: Solving a Word-Based Math Problem

Problem to Solve:

"If a train travels 90 miles in 2 hours, how long will it take to travel 225 miles at the same speed?"

1. Zero-Shot Prompt

- **Prompt:**
"If a train travels 90 miles in 2 hours, how long will it take to travel 225 miles at the same speed?"
- **AI Response:**
It will take 5 hours to travel 225 miles at the same speed.
- **Analysis:**
 - Effectiveness: Correct answer, quick response.
 - Limitation: No explanation. If the answer was wrong, we wouldn't know how it got there.

2. Few-Shot Prompt

➤ **Prompt:**

Example 1:

If a car travels 60 miles in 1 hour, how long will it take to travel 180 miles at the same speed?

Answer: 3 hours

Example 2:

If a bike goes 30 miles in 2 hours, how long will it take to go 90 miles?

Answer: 6 hours

Now solve this:

If a train travels 90 miles in 2 hours, how long will it take to travel 225 miles at the same speed?

Answer:

➤ **AI Response:**

$225 / 90 = 2.5 \rightarrow 2.5 \times 2 = 5$ hours. Answer: 5 hours.

➤ **Analysis:**

- Effectiveness: Correct answer and calculation shown.
- Benefit: Model understands the pattern via examples.
- Limitation: Needs good, relevant examples to perform well.

3. Chain-of-Thought Prompt

➤ **Prompt:**

"If a train travels 90 miles in 2 hours, how long will it take to travel 225 miles at the same speed? Let's think step by step."

➤ **AI Response:**

- Step 1: First, find the speed of the train.

Speed = Distance / Time = 90 miles / 2 hours = 45 mph.

- Step 2: Now, use the speed to find the time for 225 miles.

Time = Distance / Speed = 225 / 45 = 5 hours.

Final Answer: 5 hours.

➤ **Analysis:**

- Effectiveness: Very clear explanation and correct answer.
- Best for: Reasoning-heavy or multi-step tasks.
- Limitation: Slightly longer and might over-explain simple queries.