Prompt Engineering Techniques Guide

1. Zero-Shot Prompting

Zero-shot prompting involves asking the AI to perform a task without providing any examples. The AI relies solely on its training to understand and complete the task.

Examples:

Text Classification:

```
Classify the sentiment of this review as positive, negative, or neutral:
"The movie was okay, nothing special but not terrible either."
```

Language Translation:

```
Translate the following English sentence to French:
"I would like to order a coffee, please."
```

Mathematical Problem:

```
Solve this math problem:
What is 15% of 240?
```

Creative Writing:

```
Write a short story about a robot who discovers emotions.
```

When to Use Zero-Shot:

- Simple, well-defined tasks
- When the AI has sufficient training on similar tasks
- For general knowledge questions
- When you want to test the AI's baseline capabilities

2. One-Shot Prompting

One-shot prompting provides exactly one example to demonstrate the desired format or approach before asking the AI to complete a similar task.

Examples:

Text Classification:

```
Classify the sentiment as positive, negative, or neutral:

Example:
Text: "I absolutely loved this restaurant!"
```

```
Sentiment: Positive

Now classify:
Text: "The service was disappointing and the food was cold."
Sentiment: ?
```

Data Extraction:

```
Extract the key information from this email:

Example:
Email: "Hi John, our meeting is scheduled for Tuesday at 3 PM in Conference
Room B. Please bring the quarterly reports."
Key Info: {meeting_day: "Tuesday", time: "3 PM", location: "Conference Room
B", items_needed: "quarterly reports"}

Now extract from:
Email: "Dear Sarah, the project deadline has been moved to Friday. We need
to submit all documents by 5 PM."
Key Info: ?
```

Code Generation:

```
Convert this description to Python code:

Example:
Description: "Create a function that adds two numbers"
Code:
def add_numbers(a, b):
    return a + b

Now convert:
Description: "Create a function that finds the maximum value in a list"
Code: ?
```

When to Use One-Shot:

- When you want to establish a specific format
- For tasks that might be ambiguous without an example
- When zero-shot doesn't produce the desired output quality
- To show a specific style or approach

3. Few-Shot Prompting

Few-shot prompting provides multiple examples (typically 2-5) to give the AI a better understanding of the pattern, format, or reasoning required.

Examples:

Text Classification with Multiple Categories:

```
Classify these customer inquiries into categories:
```

```
Examples:
Inquiry: "My package hasn't arrived yet, where is it?"
Category: Shipping

Inquiry: "I want to return this item, it doesn't fit"
Category: Returns

Inquiry: "Do you have this product in blue?"
Category: Product Information

Inquiry: "My credit card was charged twice for the same order"
Category: Billing

Now classify:
Inquiry: "Can you help me reset my password?"
Category: ?
```

Creative Writing with Style:

```
Write product descriptions in this style:

Example 1:
Product: Wireless Headphones
Description: "Escape into your own sonic universe with these cutting-edge
wireless headphones. Crystal-clear highs meet thunderous bass in perfect
harmony."

Example 2:
Product: Coffee Mug
Description: "Start your morning ritual with this ceramic companion.
Crafted for those who understand that great coffee deserves a great
vessel."

Example 3:
Product: Desk Lamp
Description: "Illuminate your workspace with precision and style. This
sleek lamp transforms any desk into a productivity powerhouse."

Now write for:
Product: Yoga Mat
Description: ?
```

Mathematical Reasoning:

```
Solve these word problems step by step:

Example 1:
Problem: "A store sells apples for $2 per pound. If John buys 3.5 pounds,
how much does he pay?"
Solution: 3.5 pounds × $2/pound = $7

Example 2:
Problem: "A car travels 60 miles per hour for 2.5 hours. How far does it
travel?"
Solution: 60 mph × 2.5 hours = 150 miles

Example 3:
Problem: "A recipe calls for 2 cups of flour for 12 cookies. How much flour
is needed for 18 cookies?"
Solution: (2 cups ÷ 12 cookies) × 18 cookies = 3 cups
```

```
Now solve:
Problem: "A garden sprinkler waters 15 square feet per minute. How long
will it take to water a 225 square foot lawn?"
Solution: ?
```

When to Use Few-Shot:

- For complex tasks requiring specific patterns
- When one example isn't sufficient to convey the desired approach
- For tasks involving multiple categories or types
- When you need consistent formatting across varied inputs

4. Chain of Thought (CoT) Prompting

Chain of thought prompting encourages the AI to show its reasoning process step-by-step, leading to more accurate and explainable results.

Examples:

Mathematical Problem Solving:

```
Solve this problem step by step:

Problem: "A bakery sells cupcakes for $3 each. They offer a discount: buy
10 or more and get 20% off the total. If someone buys 15 cupcakes, how much
do they pay?"

Let me think through this step by step:
1. First, calculate the regular price: 15 cupcakes × $3 = $45
2. Check if discount applies: 15 ≥ 10, so yes, 20% discount applies
3. Calculate discount amount: $45 × 0.20 = $9
4. Calculate final price: $45 - $9 = $36

Answer: $36
```

Logical Reasoning:

```
Answer this logic puzzle by working through it step by step:

"All roses are flowers. Some flowers are red. Some red things are
beautiful. Are all roses beautiful?"

Let me reason through this:
1. All roses are flowers (given)
2. Some flowers are red (given) - but this doesn't mean ALL flowers are red
3. Some red things are beautiful (given) - but this doesn't mean ALL red
things are beautiful
4. We don't know if roses are red from the given information
5. Even if roses were red, we don't know if they'd be beautiful since only
SOME red things are beautiful
6. Therefore, we cannot conclude that all roses are beautiful
```

```
Answer: No, we cannot determine that all roses are beautiful from the given
information.
```

Complex Analysis:

```
Analyze this business scenario step by step:

"A company's revenue increased by 25% last year, but profits decreased by
10%. The company also hired 15% more employees. What might explain this
situation?"

Let me analyze this step by step:

1. Revenue analysis:
   - Revenue up 25% means more money coming in
   - This suggests business growth or higher prices

2. Profit analysis:
   - Profits down 10% despite higher revenue
   - This means costs increased more than revenue increased

3. Employee analysis:
   - 15% more employees means higher salary costs
   - More staff could indicate expansion or increased operational needs

4. Connecting the factors:
   - Higher revenue with lower profits suggests significant cost increases
   - 15% more employees would increase labor costs substantially
   - The company might be in a growth/investment phase

Possible explanations:
- Company is investing heavily in expansion (new hires, infrastructure)
- Market conditions required price reductions despite growth
- One-time expenses or investments reduced short-term profitability
- Operational inefficiencies from rapid scaling
```

Advanced Chain of Thought Techniques:

Zero-Shot Chain of Thought:

```
Solve this problem. Let's think step by step:

"If a train leaves Station A at 2:00 PM traveling at 60 mph, and another
train leaves Station B (180 miles away) at 2:30 PM traveling toward Station
A at 80 mph, when will they meet?"
```

Chain of Thought with Self-Correction:

```
Solve this and check your work:

Problem: "A rectangle has a perimeter of 24 cm and a length that is 3 cm
more than its width. What are its dimensions?"

Step 1: Set up the problem
- Let width = w
- Then length = w + 3
- Perimeter = 2(length + width) = 24
```

```
Step 2: Create equation
- 2(w + (w + 3)) = 24
- 2(2w + 3) = 24
- 4w + 6 = 24
- 4w = 18
- w = 4.5 cm

Step 3: Find length
- Length = w + 3 = 4.5 + 3 = 7.5 cm

Step 4: Check the answer
- Perimeter = 2(4.5 + 7.5) = 2(12) = 24 cm ✓
- Length is 3 cm more than width: 7.5 - 4.5 = 3 ✓

Answer: Width = 4.5 cm, Length = 7.5 cm
```

When to Use Chain of Thought:

- Complex mathematical or logical problems
- Multi-step reasoning tasks
- When you need to verify the AI's reasoning process
- For educational purposes where showing work is important
- When accuracy is critical and you want transparent reasoning

Advanced Prompt Engineering Tips

1. Combining Techniques

```
Few-shot + Chain of Thought:

Analyze these customer complaints and suggest solutions:

Example 1:
Complaint: "The delivery was 3 days late and the package was damaged"
Analysis: Two issues - delivery timing and package condition
Root causes: Logistics delay, poor packaging/handling
Solution: Expedite replacement, improve packaging standards, offer
compensation

Example 2:
Complaint: "The website kept crashing when I tried to checkout"
Analysis: Technical issue preventing purchase completion
Root causes: Website performance, server capacity, checkout process bugs
Solution: Fix technical issues, provide direct ordering assistance, offer
discount for inconvenience

Now analyze:
Complaint: "I received the wrong color item and customer service was rude
when I called"
Analysis: ?
```

2. Role-Based Prompting

```
You are an expert financial advisor. Using chain of thought reasoning, help
this client:

"I have $10,000 to invest, I'm 25 years old, and I want to retire
comfortably at 65. I'm risk-averse but understand I need growth. What
should I do?"

Let me think through this as a financial advisor:
[Continue with detailed reasoning...]
```

3. Template-Based Prompting

```
Format your response using this template:

**Problem:** [Clearly state the problem]
**Analysis:** [Break down the key factors]
**Options:** [List 2-3 possible solutions]
**Recommendation:** [Your suggested approach]
**Next Steps:** [Specific actions to take]
```

Best Practices Summary

1. **Start Simple:** Begin with zero-shot, add examples only if needed
2. **Be Specific:** Clear instructions lead to better results
3. **Show Format:** Use examples to demonstrate desired output structure
4. **Encourage Reasoning:** Ask the AI to "think step by step" for complex tasks
5. **Iterate:** Refine your prompts based on the results you get
6. **Context Matters:** Provide relevant background information
7. **Test Variations:** Try different phrasings to find what works best