

PROMPT ENGINEERING – Effective use of AI Systems

Presented by Nathan Relevy of Creative Intelligence, www.creativeintelligenceuk.com

(nrelevy@ciuk.biz)

INTRODUCTION

- **Prompt engineering is the art of crafting inputs to AI models to achieve desired outputs.**
- **Well-structured prompts improve accuracy and relevance.**
- **Used in various applications like chatbots, automation, and content generation.**
- **Learn how to get more relevant outputs from AI tools and in the preferred format**

A. Types of prompts

There are various types of prompts used in AI, each serving a specific purpose:

Direct prompts (Zero-shot)

- direct instruction or question without any additional context or examples.

An example of this is idea generation, where the model is prompted to generate creative ideas or brainstorming solutions. Another example is summarization, or translation, where the model is asked to summarize or translate some piece of content.

One-, few- and multi-shot prompts

- Direct instruction or question with one or more examples of the desired output style. This can help the model better understand the task and generate more accurate responses.

Chain of Thought Prompts

CoT prompting encourages the model to break down complex reasoning into a series of intermediate steps, leading to a more comprehensive and well-structured final output.

Zero-shot CoT Prompts

Combines chain of thought prompting with zero-shot prompting by asking the model to perform reasoning steps, which may often produce better output.

Use cases and examples of prompt engineering

Here are some specific examples and use cases showing how prompt engineering helps produce customized and relevant output.

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B. Prompting Techniques

1. Be Clear and Specific

- Use precise language and avoid ambiguity.
- Include all necessary context.

Example: ❌ *"Tell me about space."*

✅ *"Explain the process of star formation in simple terms."*

2. State the Format

- Specify how the response should be structured: text, list, table, code, etc.

Example: ❌ *"Give me Python code for sorting."*

✅ *"Provide Python code to sort a list of integers in ascending order, with comments explaining each step."*

3. Provide Context

- Add relevant details or examples for better understanding.

Example: ❌ *"Write an email."*

✅ *"Draft a professional email requesting a meeting to discuss Q1 project updates."*

4. Ask for Step-by-Step Explanations

- Request explanations for better insights.

Example: ❌ *"Solve $2x + 3 = 7$."*

✅ *"Solve $2x + 3 = 7$ step by step, showing all calculations."*

5. Use Role-Playing

- Set the model as a specific role to align with your needs.

Example: ❌ *"Explain investments."*

✅ *"You are a financial advisor. Explain the benefits of index funds to a beginner."*

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6. Use Constraints or Preferences

- Specify word limits, tone, or style to refine responses.

Example: ❌ *"Explain photosynthesis."*

✅ *"Explain photosynthesis in 100 words, suitable for a 10-year-old."*

7. Provide Examples for Clarity

- Show examples of the desired output format.

Example: ❌ *"List some programming languages."*

✅ *"List programming languages as a table with columns for 'Name' and 'Primary Use' (e.g., Python: Data Analysis, JavaScript: Web Development)."*

8. Ask for Improvements or Alternatives

- Request edits, alternatives, or refinements.

Example: ❌ *"Write a blog intro."*

✅ *"Write an engaging blog intro for a post about sustainable living. Suggest two variations."*

9. Break Complex Requests into Smaller Steps

- Simplify multifaceted prompts into sequential tasks.

Example: ❌ *"Summarize this book and suggest improvements."*

✅ *"Step 1: Summarize this book in one paragraph. Step 2: Suggest two ways to make it more engaging."*

10. Use Iterative Refinement

- Ask for iterative changes until you achieve the desired outcome.

Example: *First Prompt: "Draft a resignation email."*

Follow-Up: "Make it more formal and add a thank-you note."

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11. Leverage Hypotheticals

- Frame the problem as a scenario to get tailored advice.

Example: ❌ *"How do I improve teamwork?"*

✅ *"As a team manager, how can I foster better collaboration during remote meetings?"*

12. Ask for Sources or Citations

- Ensure factual accuracy by requesting references.

Example: ❌ *"Tell me about climate change."*

✅ *"Provide a brief summary of climate change with sources for further reading."*

13. Use Constraints for Creativity

- Add constraints to guide creative responses.

Example: ❌ *"Write a story about a hero."*

✅ *"Write a 200-word story about a hero set in a futuristic world where water is scarce."*

14. Ask for Simplification

- Request simpler explanations for complex topics.

Example: ❌ *"Explain quantum mechanics."*

✅ *"Explain quantum mechanics like I'm 12 years old."*

15. Use Comparisons

- Ask for comparisons to enhance understanding.

Example: ❌ *"What is AI?"*

✅ *"Compare AI to human problem-solving with examples."*

16. Provide Feedback

- Feedback improves iterations and outputs.

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Example: ❌ *"Rewrite this."*

✅ *"Rewrite this email to make it more concise and polite."*

17. Experiment with Open-Ended vs. Closed-Ended Questions

- Use open-ended prompts for creativity and closed-ended ones for precision.

Example:

- Open-Ended: *"Describe a futuristic city."*
 - Closed-Ended: *"List three characteristics of a futuristic city."*
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C. Language and Text Generation

Scenario		Example Prompt
Creative Writing	Craft prompts that specify genre, tone, style, and plot points to guide the AI in generating engaging narratives.	"Write a short story about a young woman who discovers a magical portal in her attic."
Summarization	Provide the AI with text and instruct it to generate concise summaries that capture key information.	"Summarize the main points of the following news article on climate change."
Translation	Specify the source and target languages to enable the AI to accurately translate text while preserving meaning and context.	"Translate the following text from English to Spanish: 'The quick brown fox jumps over the lazy dog.'"
Dialogue	Design prompts that simulate conversations, allowing the AI to generate responses that mimic human interaction and maintain context.	"You are a friendly chatbot helping users troubleshoot their computer problems. Respond to the user's query: 'My computer won't turn on.'"

Question Answering

Scenario	Instructions	Example Prompt
Open-Ended Questions	Formulate prompts that encourage the AI to provide comprehensive and informative answers based on its knowledge base.	"Explain the concept of quantum computing and its potential impact on the future of technology."
Specific Questions	Design prompts that target specific information, enabling the AI to retrieve precise answers from the provided context or its internal knowledge base.	"What is the capital of France?" or "According to the provided text, what are the main causes of deforestation?"
Multiple Choice Questions	Present prompts with options, prompting the AI to analyse and select	"Who wrote the Harry Potter series? A) J.R.R. Tolkien, B) J.K. Rowling, C) Stephen King"

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the most appropriate answer based on its understanding of the context.

Hypothetical Questions	Craft prompts that explore hypothetical situations, allowing the AI to reason, speculate, and provide potential outcomes or solutions.	"What would happen if humans could travel at the speed of light?"
Opinion-Based Questions	Design prompts that elicit the AI's perspective or opinion on a specific topic, encouraging it to provide reasoning and justification for its stance.	"Do you believe that artificial intelligence will eventually surpass human intelligence? Why or why not?"

Code Generation

Scenario	Instructions	Example Prompt
Code Completion	Provide the AI with a partial code snippet and prompt it to suggest or complete the remaining code based on the context and programming language.	"Write a Python function to calculate the factorial of a given number."
Code Translation	Specify the source and target programming languages to enable the AI to translate code while preserving functionality and syntax.	"Translate the following Python code to JavaScript: def greet(name): print('Hello,', name)"
Code Optimization	Prompt the AI to analyze existing code and suggest improvements for efficiency, readability, or performance.	"Optimize the following Python code to reduce its execution time."
Code Debugging	Provide the AI with code containing errors and prompt it to identify and suggest potential solutions for the identified issues.	"Debug the following Java code and explain why it is throwing a NullPointerException."

Image Generation

Scenario	Instructions	Example Prompt
Photorealistic Images	Craft prompts that describe the desired image in detail, including objects,	"A photorealistic image of a sunset over the ocean with palm trees silhouetted against the sky."

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scenery, lighting, and style, to generate realistic and high-quality images.

Artistic Images	Design prompts that specify art styles, techniques, and subject matter to guide the AI in creating images that mimic specific artistic movements or evoke certain emotions.	"An impressionist painting of a bustling city street with people walking under umbrellas in the rain."
Abstract Images	Formulate prompts that encourage the AI to generate images that are open to interpretation, utilizing shapes, colours, and textures to evoke feelings or concepts.	"An abstract image representing the concept of hope, using bright colours and flowing shapes."
Image Editing	Provide the AI with an existing image and specify desired modifications, enabling it to edit and enhance the image according to the given instructions.	"Change the background of this photo to a starry night sky and add a full moon." or "Remove the person from this image and replace them with a cat."

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D. Strategies for writing better prompts

Developing effective prompts requires a strategic approach. Consider these strategies to enhance your prompt engineering skills:

1. Set Clear Goals and Objectives:

Tactic	Prompt Example
Use action verbs to specify the desired action	"Write a bulleted list that summarizes the key findings of the attached research paper"
Define the desired length and format of the output	"Compose a 500-word essay discussing the impact of climate change on coastal communities."
Specify the target audience	"Write a product description for a new line of organic skincare products, targeting young adults concerned with sustainability."

2. Provide Context and Background Information:

Tactic	Prompt Example
Include relevant facts and data	"Given that global temperatures have risen by 1 degree Celsius since the pre-industrial era, discuss the potential consequences for sea level rise."
Reference specific sources or documents	"Based on the attached financial report, analyse the company's profitability over the past five years."
Define key terms and concepts	"Explain the concept of quantum computing in simple terms, suitable for a non-technical audience."

3. Use Few-Shot Prompting:

Tactic	Prompt Example
Provide a few examples of desired input-output pairs	Input: "Cat" Output: "A small furry mammal with whiskers." Input: "Dog" Output: "A domesticated canine known for its loyalty." Prompt: "Elephant"
Demonstrate the desired style or tone	Example 1 (humorous): "The politician's speech was so dull, it could cure insomnia." Example 2 (formal): "The dignitary delivered an

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address that was both informative and engaging." Prompt: "Write a sentence describing the comedian's stand-up routine."

Show the desired level of detail

Example 1 (brief): "The movie was about a young boy who befriends an alien." Example 2 (detailed): "The science fiction film follows the story of Elliot, a lonely boy who discovers and forms a unique bond with an extraterrestrial stranded on Earth." Prompt: "Summarize the plot of the novel you just finished reading."

4. Be Specific:

Tactic	Prompt Example
Use precise language and avoid ambiguity	Instead of: "Write something about climate change," use: "Write a persuasive essay arguing for the implementation of stricter carbon emission regulations."
Quantify your requests whenever possible	Instead of: "Write a long poem," use: "Write a sonnet with 14 lines that explores themes of love and loss."
Break down complex tasks into smaller steps	Instead of: "Create a marketing plan," use: "1. Identify the target audience. 2. Develop key marketing messages. 3. Choose appropriate marketing channels."

5. Iterate and Experiment:

Tactic	Action
Try different phrasings and keywords	Rephrase your prompt using synonyms or alternative sentence structures.
Adjust the level of detail and specificity	Add or remove information to fine-tune the output.
Test different prompt lengths	Experiment with both shorter and longer prompts to find the optimal balance.

6. Leverage Chain of Thought Prompting:

Tactic	Prompt Example
Encourage step-by-step reasoning	"Solve this problem step-by-step: John has 5 apples, he eats 2. How many apples does he have left? Step 1: John starts with 5 apples."

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Step 2: He eats 2 apples, so we need to subtract 2 from 5. Step 3: $5 - 2 = 3$. Answer: John has 3 apples left."

Ask the model to explain its reasoning process

"Explain your thought process in determining the sentiment of this movie review: 'The acting was superb, but the plot was predictable.'"

Guide the model through a logical sequence of thought

"To classify this email as spam or not spam, consider the following: 1. Is the sender known? 2. Does the subject line contain suspicious keywords? 3. Is the email offering something too good to be true?"

Benefits of prompt engineering

Effective prompt engineering offers numerous benefits, enhancing the capabilities and usability of AI models:

Improved model performance

Well-crafted prompts lead to more accurate, relevant, and informative outputs from AI models, as they provide clear instructions and context.

Reduced bias and harmful responses

By carefully controlling the input and guiding the AI's focus, prompt engineering helps mitigate bias and minimize the risk of generating inappropriate or offensive content.

Increased control and predictability

Prompt engineering empowers you to influence the AI's behaviour and ensure consistent and predictable responses aligned with your desired outcomes.

Enhanced user experience

Clear and concise prompts make it easier for users to interact effectively with AI models, leading to more intuitive and satisfying experiences.