Erasmus+

Mastering Prompt Engineering: Enhancing AI Interactions

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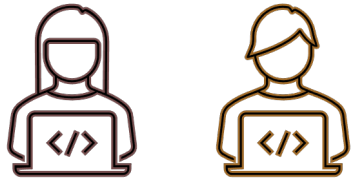

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Lesson 1

The Basics

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Prompt Engineering

- Prompt Engineering = a subfield of AI that focuses on designing, testing, and refining prompts to elicit desired responses from AI models.

- A prompt is an input given to an AI model to generate a specific output.
  - For example, when you ask a voice assistant like Siri or Alexa a question, the question is ***the prompt***, and the answer from the assistant is the response.

- The effectiveness of an AI model's response heavily depends on the quality of the prompt.
  - A well-crafted prompt can guide an AI model to produce more accurate, relevant, and useful responses.
  - On the other hand, a poorly designed prompt may lead to ambiguous or incorrect responses.
- Prompt engineering is crucial in many AI applications, from chatbots and virtual assistants to AI tutors and content-generation tools.
  - It helps improve the user experience by making AI interactions more efficient and meaningful.

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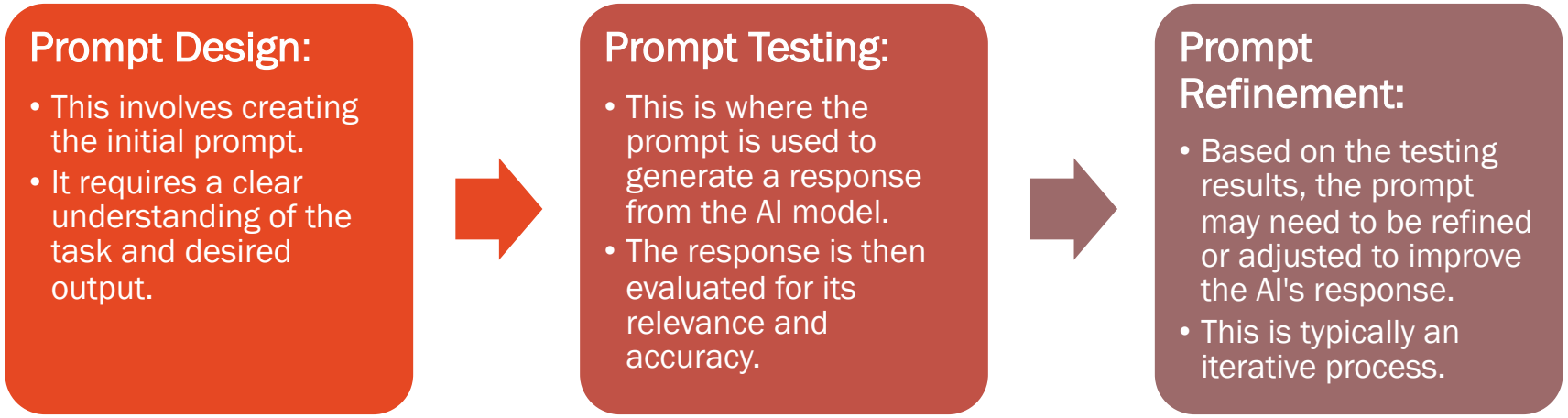
Components of Prompt Engineering



The importance of Prompt Engineering

Accuracy:	A well-crafted prompt can guide an AI model to produce more accurate responses.
	This is particularly important in applications where precision is key, such as medical diagnosis AI or financial prediction models.
Efficiency:	Good prompts can help AI models generate responses more efficiently, reducing the need for back-and-forth interactions and saving time for the user.
User Experience:	The quality of prompts directly impacts the user experience.
	Clear, concise prompts can make interactions with AI models more enjoyable and productive.
Scalability:	With good prompts, AI models can handle a wider range of tasks and serve more users effectively.

Applications of Prompt Engineering

Virtual Assistants:

- Siri, Alexa, and Google Assistant use prompts to understand user requests and provide relevant responses.

Chatbots:

- Customer service chatbots use prompts to guide conversations and provide helpful information.

AI Tutors:

- AI-based learning platforms use prompts to guide student learning and provide personalized feedback.

Content Generation Tools:

- AI tools like GPT-3 use prompts to generate articles, stories, and other types of content.

AI Therapy Apps:

- Mental health apps use prompts to guide therapeutic conversations and provide support.

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AI Models (1)

- AI models are computational structures designed to learn from data and make predictions or decisions.
- They are the 'brains' behind AI applications, enabling them to perform tasks such as understanding natural language, recognizing images, playing games, and more.

- There are many AI models, but in the context of prompt engineering, we're primarily interested in language models.
    - These models, such as GPT-3, BERT, and Transformer, are designed to understand and generate human language.

Learn more about Large Language Models (LLMs) in this video by Google>
https://youtu.be/zizonToFXDs

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AI Models (2) – How do AI models respond to prompts?

- When an AI model receives a prompt, it processes the input and generates a response based on its training.
- The model doesn't 'understand' the prompt in the way humans do.
- Instead, it uses patterns it learned during training to produce a response that it predicts will be the most appropriate.
    - For example, if you ask a language model, "What is the capital of France?", it doesn't 'know' the answer in the way a human does.
    - Instead, it generates the response "Paris" because it has seen many examples during training where "Paris" is the answer to that prompt.

- ***Therefore, it can "hallucinate" or "lie", if the input data that it uses to train is faulty.***

Learn more about Large Language Models (LLMs) in this video by Google>
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AI Models (3)

Factors Influencing AI Responses

Training Data:

The data used to train the model heavily influences its responses.

If the model has been trained on diverse, high-quality data, it's more likely to generate accurate and relevant responses.

Model Architecture:

The structure of the model, including the number and arrangement of its layers and nodes, can affect its ability to understand complex prompts and generate appropriate responses.

Prompt Quality:

The quality of the prompt is crucial.

A clear, concise, and well-structured prompt is more likely to elicit the desired response.

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Prompt Design (1)

Prompt design is the process of crafting inputs (prompts) to elicit desired outputs from an AI model.

It's a blend of understanding the AI model, the task, and the user's needs.

The goal is to create prompts that guide the AI to generate accurate, relevant, and useful responses.

Prompt Design (2) - Principles

Clarity

The prompt should be unambiguous. Avoid jargon, slang, or complex language that the AI model might struggle to understand.

Specificity

The more specific the prompt, the more likely it is to elicit the desired response. For example, instead of asking an AI to "write a story," you might ask it to "write a short romance story set in Regency London."

Contextual Appropriateness

The prompt should be appropriate for the context in which it's used. For instance, a prompt for a customer service chatbot should be professional and focused on solving the customer's issue.

User Centricity

The prompt should be designed with the end user in mind. It should consider the user's needs, preferences, and level of understanding.

Iterative Refinement

Prompt design is rarely a one-and-done process. It often involves testing, refining, and retesting the prompt based on the responses received from the AI model.

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Context & Relevance

Context

- Context refers to the surrounding information that helps clarify the meaning of a prompt.
- It can include previous interactions, the user's profile or preferences, the application's purpose, and more.
  - For example, if a user interacts with a music recommendation AI and asks, "What should I listen to next?" the context might include the user's previous song choices and their stated music preferences, and the AI's purpose is to recommend music.
- Context is important because it helps the AI model generate more relevant and personalized responses.
- Without context, the AI might struggle to understand the user's intent and provide a useful response.
  - For instance, in the music recommendation example above, the AI might recommend a random song without context. But with context, it can recommend a song that aligns with the user's tastes and listening history.

Relevance

- Relevance refers to how closely a prompt aligns with the desired output.
- A relevant prompt is one that effectively guides the AI model to produce the desired response.
  - For example, if you're using an AI model to generate a recipe, a relevant prompt might be, "Generate a recipe for a vegetarian lasagna that serves four people."
  - This prompt is relevant because it clearly states the desired output.
- Relevance is important because it increases the likelihood of the AI model generating the desired response.
- A relevant prompt provides clear guidance to the AI, reducing the chances of it producing an off-topic or unhelpful response.

Type of prompt	Explanation	Example	Perfected Prompt – with context and relevance
Open-Ended Prompts	- designed to encourage a broad range of responses. - often used when you want the AI model to generate creative or diverse outputs.	Write a short story about a Victorian London detective.	Compose a brief narrative featuring a detective character set in the Victorian era of London, incorporating elements of mystery, the socio-cultural context of the time, and the distinctive ambiance of the city.
Closed-Ended Prompts	- designed to elicit a specific response. - often used when you want the AI model to provide a factual answer or perform a specific task.	What is the capital of France?	Please provide a detailed and comprehensive response by stating the exact name of the city that serves as the capital of France.
Instructional Prompts	- designed to guide the AI model to perform a specific task or series of tasks. - often used in applications where the AI model needs to follow a specific process or sequence	Translate the following English text to Romanian: 'Hello, how are you?'	Please precisely and comprehensively translate the English phrase 'Hello, how are you?' into Romanian without slang and colloquialisms.
Exploratory Prompts	- designed to encourage the AI model to generate various possible solutions or ideas. - often used in brainstorming or problem-solving applications.	Generate ten potential names for a new mobile app that helps people cook vegetarian.	Please list ten possible names for a novel mobile application that assists individuals in preparing vegetarian meals.

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Lesson 2

Advanced Prompt Engineering

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Technique 1: Explicit Instruction

- For example, if you want the AI model to generate a poem, you might use a prompt like "Write a sonnet about the moon." The more specific your instruction, the more likely the AI model is to generate the desired response.

Technique 2: Providing Context

- . For instance, if you're using a language translation AI and you want it to translate a slang phrase, providing context can help the AI understand the phrase's meaning and generate a more accurate translation.

Better prompts

Technique 3: Using Examples

- For example, if you want the AI model to generate a list of bullet points summarizing a text, you might start by providing an example of what you're looking for: "Summarize the following text in bullet points, like this: - Point 1: ... - Point 2: ..."

Technique 4: Prompt Sequencing

- Prompt sequencing involves using a series of prompts to guide the AI model toward a specific response. This can be particularly useful for complex tasks that require multiple steps.
- For example, suppose you're using an AI model to help design a website. In that case, you might start with a prompt asking for a general layout, followed by prompts asking for specific elements like color schemes, typography, etc.

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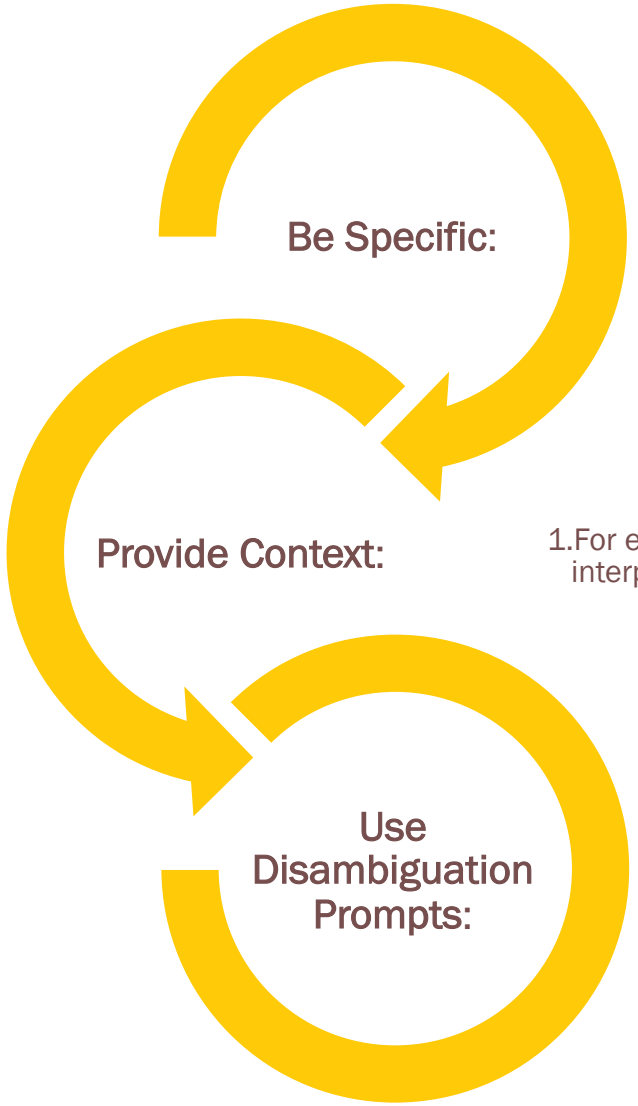
Handling Ambiguity

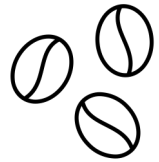
Ambiguity can be a problem because it can lead to unexpected or unhelpful responses from AI models.

If a prompt can be interpreted multiple ways, the AI model might not generate the response you want.



1. The more specific your prompt, the less room there is for ambiguity.
2. For example, instead of "Tell me about Java", you might say "Tell me about the Java programming language".

1. For example, if you're interacting with a programming-focused AI model, it's more likely to interpret "Java" as referring to the programming language.



1. If a user provides an ambiguous prompt, you can use a disambiguation prompt to clarify their intent.
2. For example, if a user says "Tell me about Java", the AI model might respond with "Do you want to know about the Java programming language, the island of Java in Indonesia, or Java coffee?"

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Complex tasks – e.g., writing a detailed report, creating a comprehensive plan, or generating a piece of creative writing

Challenges in Designing Prompts for Complex Tasks

1. **Multiple Steps**: Complex tasks often involve multiple steps, each of which might require its prompt. Sequencing these prompts effectively can be challenging.
2. **Deep Understanding**: Complex tasks often require a deep understanding of a subject. Crafting prompts that guide the AI model to demonstrate this understanding can be difficult.
3. **Variety of Outputs**: Complex tasks often have many possible correct outputs. Designing prompts that guide the AI model to generate a useful output without overly constraining its creativity can be a delicate balance.

Techniques for Designing Prompts for Complex Tasks

1. **Prompt Sequencing**: Prompt sequencing involves using a series of prompts to guide the AI model through the steps of a complex task.
2. **Providing Detailed Instructions**: For complex tasks, it can be helpful to provide detailed instructions in the prompt. This can guide the AI model to demonstrate a deep understanding and produce a detailed output.
3. **Iterative Refinement**: As always, iterative refinement is key. You should test and refine your prompts several times to get the desired output for a complex task.

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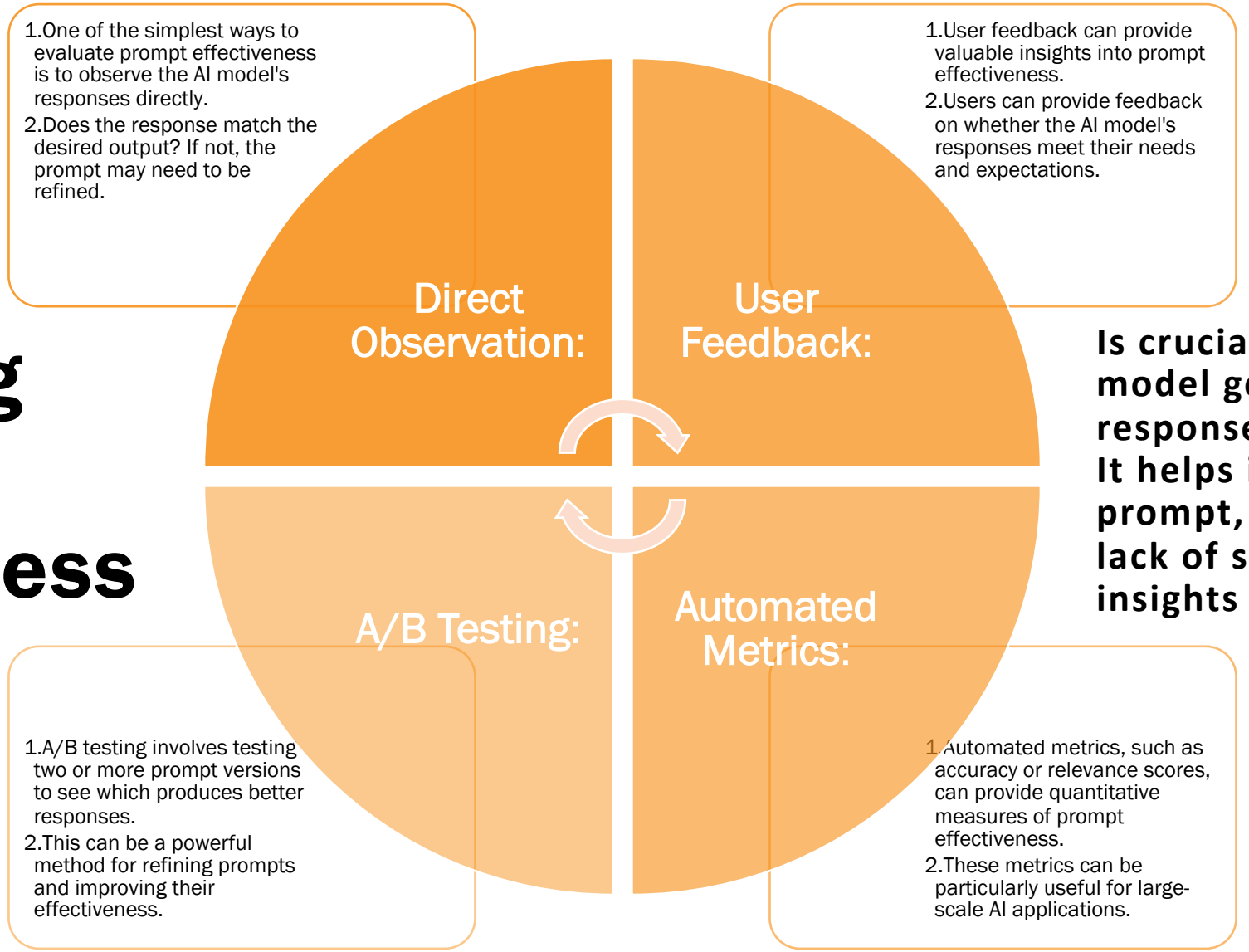
Measuring prompt effectiveness



Is crucial to ensure the AI model generates the desired responses.
It helps identify issues with the prompt, such as ambiguity or lack of specificity and provides insights for refining it.

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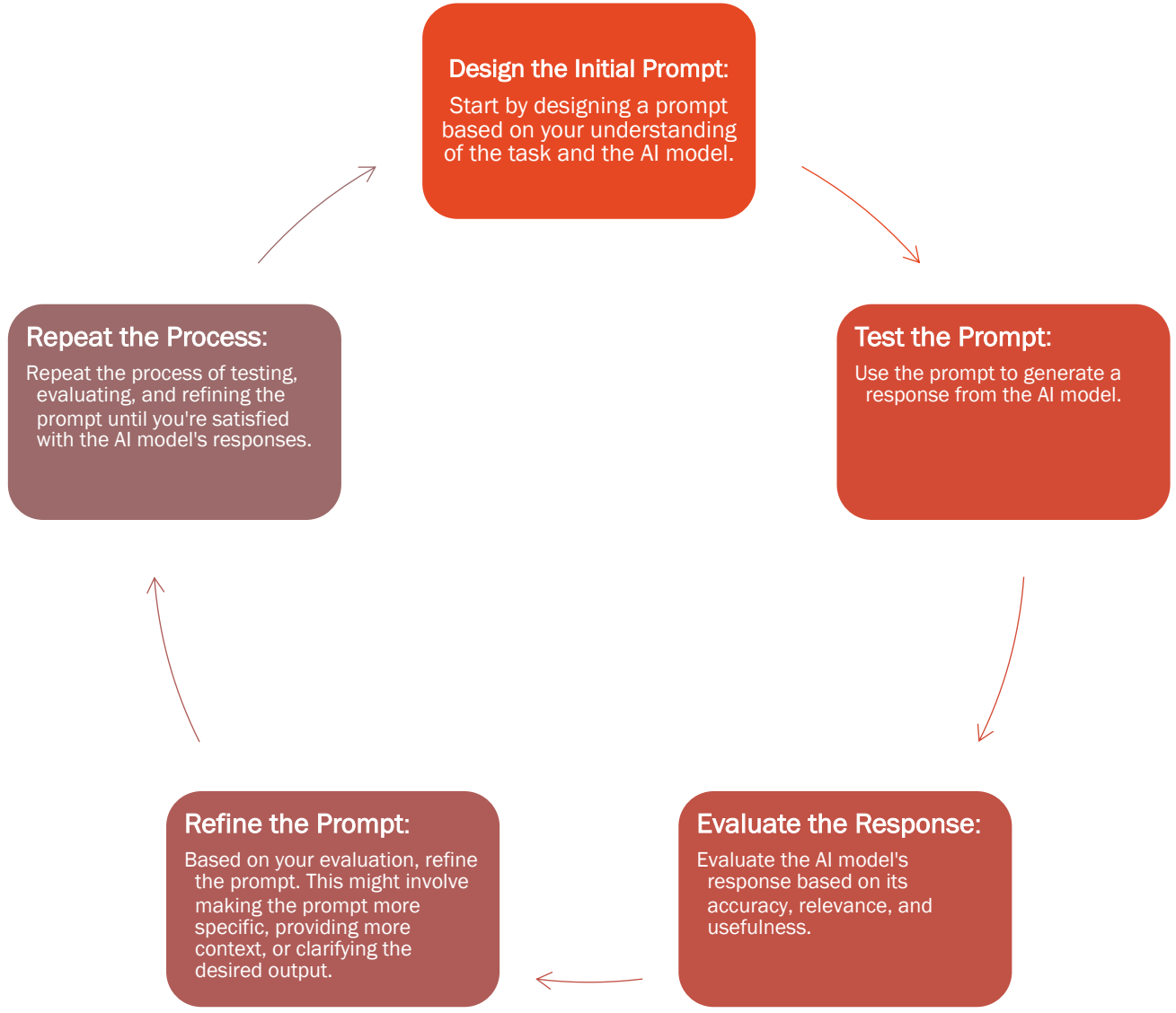
Prompt Refinement

- Prompt refinement is adjusting and improving prompts based on the responses they elicit from an AI model.
- The goal is to make the prompts more effective at guiding the AI model to generate the desired responses.
- It is important because it helps improve the effectiveness of prompts over time.



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Prompt refinement examples

Customer Service Chatbot

- A company has a customer service chatbot that uses AI to answer customer queries. Initially, the chatbot needed help understanding queries about the company's return policy. The initial prompt was "What can I help you with today?" After several rounds of refinement, the prompt was changed to "Do you have questions about our products, your order, or our return policy?"

AI tutor:

- An ed-tech company has an AI tutor that helps students learn math. The initial prompt for solving algebra problems was "Solve the following problem." However, the AI tutor often needed to explain the steps. The prompt was refined to "Explain the steps to solve the following problem, then provide the solution."

Media Company AI writer:

- A media company uses an AI tool to generate article drafts. The initial prompt was "Write an article about the following topic." However, the articles often needed more structure. The prompt was refined to "Write an introduction, three main points with supporting evidence, and a conclusion about the following topic."

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Multi-modal Prompt Design

Multi-modal prompt design involves creating prompts for AI models that can understand and generate multiple data types, such as text, images, audio, and video.

For example, you might design a prompt for an AI model that generates a description of an image or a prompt for an AI model that generates a speech transcript from an audio file.

Multimodal Models

Multimodal models are AI models that can process and generate multiple data types, such as text, images, and audio.

These models are increasingly used in applications like virtual assistants, which must understand and respond to spoken and written commands.

Multilingual Models

Multilingual models are AI models that can understand and generate multiple languages.

These models are used in applications like translation services, multilingual chatbots, and global customer service platforms.

Interactive Tasks

Interactive tasks are tasks that involve ongoing interactions between the user and the AI model.

Examples might include a conversation with a chatbot, a tutoring session with an AI tutor, or a game played against an AI opponent.

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Multimodal prompt design

Challenges in Multi-modal Prompt Design

1. **Complexity**: Multi-modal tasks are often more complex than single-modal tasks, requiring more careful and detailed prompt design.
2. **Data Diversity**: Multi-modal AI models deal with a wide range of data types, each of which might require different prompt design strategies.
3. **Interpreting Outputs**: The outputs of multi-modal AI models can be more difficult to interpret and evaluate, making the process of refining prompts more challenging.

Strategies for Multi-modal Prompt Design

1. **Understand the Modalities**: Start by understanding the different types of data the AI model can handle. What are the characteristics of each modality? How does the AI model process and generate each type of data?
2. **Design Specific Prompts**: Design prompts that are specific to each modality. For example, a prompt for generating a text description of an image might be different from a prompt for generating a speech transcript from an audio file.
3. **Iterative Refinement**: As always, iterative refinement is key. Test your prompts, evaluate the AI model's responses, and refine your prompts based on your findings.

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Interactive tasks prompt design

Challenges in Designing Prompts for Interactive Tasks

1. **Maintaining Context**: Interactive tasks often require the AI model to maintain context across multiple turns of interaction. Designing prompts that help the AI model maintain this context can be challenging.
2. **Managing User Inputs**: In interactive tasks, the user can provide inputs at any time. Designing prompts that can handle a wide range of user inputs is a complex task.
3. **Balancing Responsiveness and Initiative**: In interactive tasks, the AI model needs to be responsive to the user's inputs, but it might also need to take the initiative at times. Balancing these requirements can be tricky.

Strategies for Designing Prompts for Interactive Tasks

1. **Contextual Prompts**: Design prompts that incorporate the context of the ongoing interaction. This can help the AI model maintain context across multiple turns of interaction.
2. **Flexible Prompts**: Design prompts that are flexible enough to handle a wide range of user inputs. This can help the AI model respond effectively to unexpected inputs.
3. **Balanced Prompts**: Design prompts that balance responsiveness and initiative. Depending on the task, you might design prompts that guide the AI model to ask questions, make suggestions, or take other initiatives.

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Multimodal Models prompt design

Challenges in Prompt Engineering for Multimodal Models

- Prompt engineering for multimodal models can be challenging because you need to consider multiple types of data in your prompts.
- For example, a prompt for a multimodal model might need to include both text and image data, and the model's response might need to be evaluated across multiple dimensions.

Techniques for Prompt Engineering for Multimodal Models

1. **Integrating Multiple Data Types**: When designing prompts for multimodal models, consider how different types of data can be integrated into the prompt. For example, a prompt might include a text description and an image, or a text question and an audio clip.
2. **Evaluating Multimodal Responses**: Evaluating responses from multimodal models can be complex, as you need to consider the quality and relevance of each type of data the model generates. Developing clear criteria for evaluating multimodal responses is crucial.

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Multilingual Models prompt design

Challenges in Prompt Engineering for Multilingual Models

- Prompt engineering for multilingual models can be challenging because you need to consider language-specific nuances in your prompts.
- For example, a prompt that works well in English might not work as well in another language due to differences in grammar, vocabulary, or cultural context.

Techniques for Prompt Engineering for Multilingual Models

1. **Language-Specific Prompts**: When designing prompts for multilingual models, consider the specific characteristics of each language. This might involve working with language experts or native speakers.
2. **Cultural Sensitivity**: Be aware of cultural differences that might affect how prompts are interpreted. A prompt that is culturally sensitive in one language might not be in another.

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Lesson 3

Ethical Considerations and Future Trends

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Understanding Bias

Bias =

- Bias in AI responses refers to situations where an AI model's responses unfairly favor certain groups or perspectives or perpetuate harmful stereotypes.
- This bias often arises from the data the AI model was trained on. If the training data contains bias, the AI model will likely reproduce it in its responses.

Problem?

- Bias is a problem because it can lead to unfair or harmful outcomes.
- For example, a biased AI model might provide less accurate or less helpful responses to users from certain groups.
- It might also perpetuate harmful stereotypes or misinformation.

Solution?

- Prompt engineering can help mitigate bias by guiding the AI model to generate fairer and more balanced responses.
- For example, prompts can encourage the AI model to consider multiple perspectives or avoid making assumptions based on stereotypes.

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Ethical Guidelines for Prompt Design

Respect User Privacy

- Prompts should be designed to respect user privacy.
- Avoid prompts encouraging users to share sensitive personal information and ensure that your prompts comply with relevant privacy laws and regulations.

Avoid Harmful or Offensive Content

- Prompts should be designed to avoid eliciting harmful or offensive content from the AI model.
- This includes content that is violent, discriminatory, or otherwise harmful.

Promote Fairness and Inclusivity

- Prompts should be designed to promote fairness and inclusivity.
- This means avoiding prompts that favor certain groups or perspectives and striving to create inclusive and respectful prompts for all users.

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Fixing Harmful or Unwanted Responses

inappropriate, offensive, misleading, or problematic
(e.g., responses that contain misinformation, perpetuate harmful stereotypes, or violate user privacy)

Designing Careful Prompts

By crafting clear, specific, and respectful prompts, you can guide the AI model away from harmful or unwanted content.

Using Moderation Tools

- Many AI platforms provide moderation tools to filter harmful or unwanted content.
- These tools can be combined with careful prompt design to reduce the risk of harmful or unwanted responses.

Iterative Refinement

- As always, iterative refinement is key.
- If a prompt elicits a harmful or unwanted response, refine it and test it again until the response is satisfactory.

The Future...

Emerging Trends in Prompt Engineering

1. **Advanced AI Models**: As AI models become more advanced, they can handle more complex tasks and generate more sophisticated outputs. This creates new opportunities for prompt engineering but also new challenges in designing effective prompts.
2. **Multi-modal and Interactive Tasks**: Multi-modal and interactive tasks are becoming increasingly common. These tasks require new approaches to prompt design.
3. **Ethical and Societal Considerations**: As AI models are used in more areas of life, ethical and societal considerations are becoming increasingly important. This includes issues like bias, privacy, and the impact of AI on jobs and society.

Future Skills in Prompt Engineering

1. **Understanding Advanced AI Models**: As AI models become more advanced, understanding how they work and how to design effective prompts for them will become increasingly important.
2. **Multi-modal and Interactive Prompt Design**: Skills in multi-modal and interactive prompt design will be in high demand as these types of tasks become more common.
3. **Ethical Prompt Design**: Skills in ethical prompt design, including understanding and mitigating bias, respecting user privacy, and considering societal impacts, will be crucial for future prompt engineers.

Challenges for the Future of Prompt Engineering

1. **Complexity**: As AI models become more complex, designing effective prompts will also become more challenging. We'll need to develop new techniques and tools to manage this complexity.
2. **Ethics**: As mentioned above, ethical considerations will become increasingly important in prompt engineering. We'll need to navigate issues like bias, privacy, and fairness.
3. **Evaluation**: As prompts become more complex and personalized, evaluating their effectiveness will also become more challenging. We'll need to develop new metrics and evaluation methods to keep up.

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It is all, however, about asking better questions.

Check out these TedTalks about asking better questions:

- **How to Ask Better Questions | Mike Vaughan** https://youtu.be/J8xfuCcXZu8
- **The Art of Powerful Questions | Allen Saakyan** https://youtu.be/PmqGe8DtWgI