



NATIONAL CENTRE OF
ARTIFICIAL INTELLIGENCE



The Prompt Report: A Systematic Survey of Prompting Techniques

Making the world a better place through Artificial Intelligence!

Table of contents

- Introduction
- Background and Motivation
- Taxonomy of Prompting Techniques
- Text-Only Prompting Techniques
- Prompting Techniques for Other Modalities
- Vocabulary of Prompting Terms
- Literature Meta-Analysis
- Applications of Prompting Techniques
- Challenges and Future Directions
- Conclusion

Introduction

What is Prompt?

A prompt is an input to a Generative AI model, that is used to guide its output

Tell me five good books to read.

Prompt Template

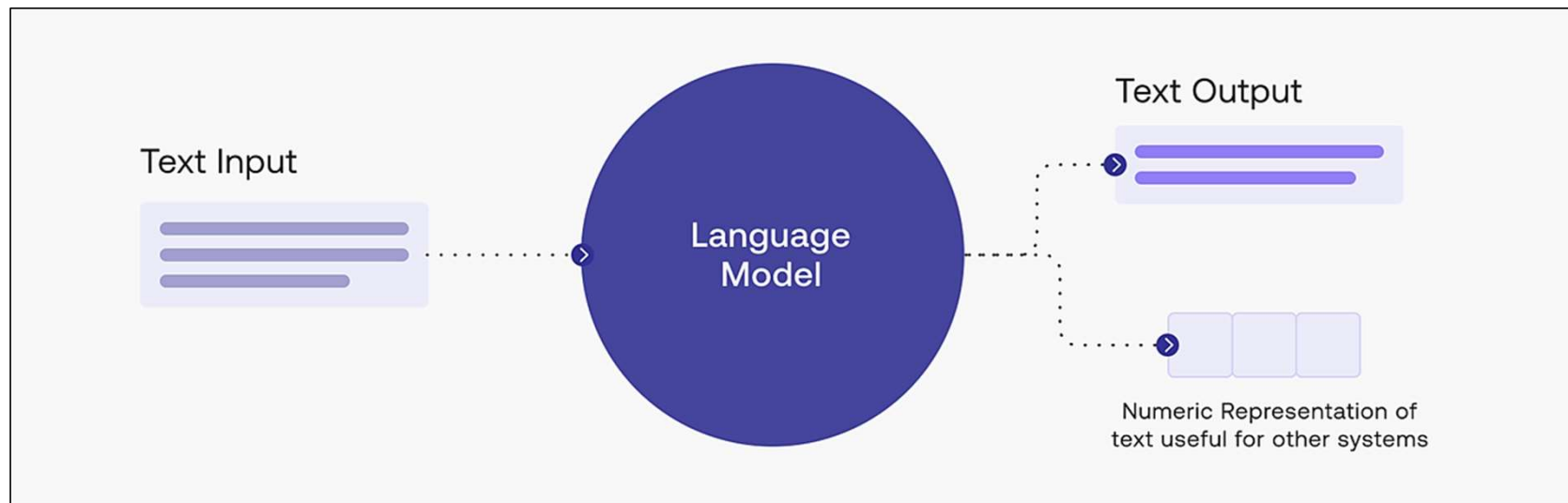
A prompt template is a function that contains one or more variables which will be replaced by some media (usually text) to create a prompt

```
Classify the tweet as positive or negative:  
{TWEET}
```

```
{PARAGRAPH}  
Summarize this into a CSV
```

LLM's

LLMs are natural language processing computer programs that use artificial neural networks to generate text and source code.



LLM's

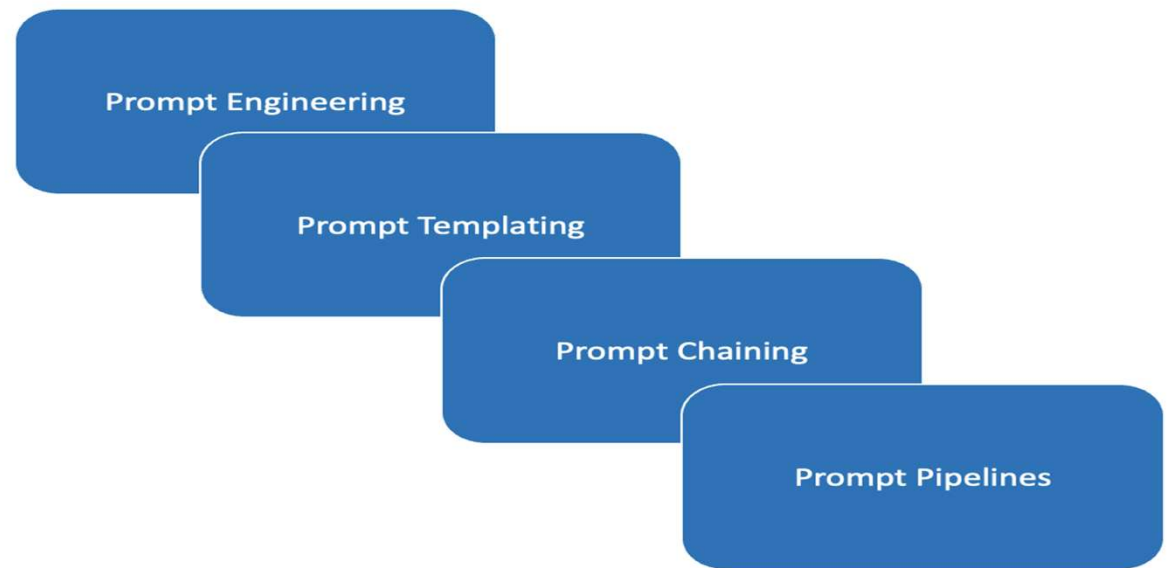
Some notable LLM's are:

- ChatGPT
- GPT-4
- LaMDA
- BLOOM
- PaLM
- BARD

A Meta-Analysis of Prompting

The Pipeline

Structured sequence of prompts or input processing steps designed to elicit specific responses or perform certain tasks effectively



In-Context Learning (ICL)

- ICL refers to the ability of GenAIs to learn skills and tasks by providing them with exemplars and or relevant instructions within the prompt

Few Shot Prompting

- A few-shot prompt is similar to a one-shot prompt, but it provides multiple examples to help the AI model better understand the desired output. This allows the model to generalize the task more effectively.

Few Shot Prompting

Prompt:

```
Positive This is awesome!  
This is bad! Negative  
Wow that movie was rad!  
Positive  
What a horrible show! --
```

Output:

```
Negative
```

Zero Shot Prompting

- A zero-shot prompt is one where the AI model has not been provided with any examples or context to help it understand the task it's being asked to perform.

Zero Shot Prompting

Prompt:

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

Output:

```
Neutral
```

Role Prompting

- Role prompting involves assigning specific roles to the language model within the prompt to guide its responses. This technique helps in generating more focused and relevant outputs

Role Prompting

Scenario: Customer Support Chatbot

Role Prompt: "You are a customer support representative for an online bookstore. Your task is to help the customer with their inquiries about their orders, book recommendations, and any issues they might face with their account. Please respond politely and professionally."

Example Interaction

User: "Hi, I ordered a book last week, but I haven't received any updates on the shipping status. Can you help me with that?"

Model (Role: Customer Support Representative):

"Hello! I'd be happy to assist you with that. Could you please provide me with your order number so I can check the status for you?"

Style Prompting

- Style prompting involves guiding the language model to generate text in a specific style or tone.

Prompt: "You are writing a formal email to a potential business partner to introduce your company's services."

Output:

"Dear Mr. Smith,

I hope this message finds you well. My name is John Doe, and I am the Director of Sales at XYZ Corporation. We specialize in providing innovative software solutions tailored to meet the unique needs of businesses like yours.

Emotion Prompting

- Emotion prompting involves guiding the language model to generate text that conveys a specific emotion, such as happiness, sadness, anger, or excitement.

Prompt: "Write a letter to a friend expressing your happiness about getting a new job."

Output:

"Hey Emily,

I have the best news to share with you! I just got the job I was hoping for, and I couldn't be happier! It's exactly what I've been looking for, and I can't wait to start. It feels like all the hard work has finally paid off.

Rephrase and Respond (RaR)

It is a technique used to enhance the quality of interactions with AI language models. It have two main parts.

1. Rephrasing the user's input to clarify or improve the understanding of the query.
2. providing a relevant and accurate response

Rephrase and Respond (RaR)

Example Scenario: Customer Inquiry

User Input: "I can't log into my account. Help!"

Rephrase Step: The model rephrases the input to ensure it understands the issue correctly.

"Are you having trouble logging into your account? Could you please provide more details about the problem, such as any error messages you're seeing?"

Respond Step: The model then provides a response based on the rephrased input.

"Thank you for reaching out. If you are experiencing issues logging into your account, please try the following steps:

1. Ensure you are using the correct username and password.
2. Check if the Caps Lock key is on by mistake.
3. If you've forgotten your password, click on the 'Forgot Password' link to reset it.
4. Clear your browser's cache and cookies and try logging in again.

Chain-of-Thought(CoT) Prompting

- *Chain-of-Thought (CoT) prompting is a technique used to guide language models through complex reasoning tasks by breaking down the reasoning process into a series of logical, sequential steps.*

Chain-of-Thought(CoT) Prompting

Example Scenario: Solving a Math Problem

Problem: "What is the result of 25 multiplied by 4, plus 10, minus 6?"

Chain-of-Thought Prompting:

1. **Step 1: Identify the operations and their order.**
"First, identify the operations: multiplication, addition, and subtraction."
2. **Step 2: Perform the multiplication.**
"Multiply 25 by 4 to get 100."
3. **Step 3: Perform the addition.**
"Add 10 to 100 to get 110."
4. **Step 4: Perform the subtraction.**
"Subtract 6 from 110 to get 104."

Final Response:

"The result of 25 multiplied by 4, plus 10, minus 6 is 104."

Step-Back Prompting

- *Step-Back Prompting is a technique used to guide language models in revisiting and refining their previous responses based on feedback or new information. It involves prompting the model to reconsider its initial output and make adjustments or additions as necessary, improving the accuracy and relevance of the final response.*

Step-Back Prompting

Another Example Scenario: Correcting a Misinterpretation

Initial Response: "The Statue of Liberty was built in 1876."

Step-Back Prompting:

1. **Step 1: Review the initial response.**

"Actually, the Statue of Liberty was dedicated in 1886. Could you correct the date?"

2. **Step 2: Adjust the response based on feedback.**

"Apologies for the mistake. The Statue of Liberty was dedicated on October 28, 1886, as a gift from France to the United States."

3. **Step 3: Provide additional context.**

"Designed by Frederic Auguste Bartholdi, the statue symbolizes freedom and democracy and stands on Liberty Island in New York Harbor."

Final Response:

"The Statue of Liberty was dedicated on October 28, 1886, as a gift from France to the United States. It stands as a symbol of freedom and democracy on Liberty Island in New York Harbor."

Thread-of-Thought (ThoT) Prompting

- *Thread-of-Thought (ThoT) prompting is a method used to encourage AI language models to maintain a coherent and consistent narrative or train of thought across multiple responses or interactions.*

Thread-of-Thought (ThoT) Prompting

Example Scenario: Creative Writing

Initial Prompt: "Write a short story about a detective solving a mysterious disappearance."

Thread-of-Thought (ThoT) Prompting:

1. **Response 1:** "Detective Smith received a call late at night about a missing person, Mr. Johnson, a wealthy businessman known for his reclusive nature."
2. **Prompt 2:** "What does Detective Smith do first upon arriving at Mr. Johnson's mansion?"
3. **Response 2:** "Detective Smith cautiously approached the mansion's front door, noticing it was slightly ajar. He drew his flashlight and entered, scanning the grand foyer for any signs of struggle or clues."
4. **Prompt 3:** "Did Detective Smith find any initial clues inside the mansion?"
5. **Response 3:** "As Detective Smith continued his search, he discovered an overturned chair in the study, papers scattered on the floor. Among them, a half-burned letter caught his attention, hinting at a possible business dispute involving Mr. Johnson."

Tabular Chain-of-Thought (Tab-CoT)

- *Tabular Chain-of-Thought (Tab-CoT) prompting is a method that structures complex reasoning tasks in a tabular format to break down the process into clear, logical steps.*

Tabular Chain-of-Thought (Tab-CoT)

Before Calculation

Example Scenario: Analyzing Financial Data

Problem: "Calculate the total revenue for a company over four quarters and determine the average quarterly revenue."

Tabular Chain-of-Thought (Tab-CoT) Prompting:

1. Step 1: Gather quarterly revenue data.

Quarter	Revenue (\$)
Q1	15,000
Q2	18,000
Q3	22,000
Q4	20,000

After Calculation

Final Response:

Quarter	Revenue (\$)
Q1	15,000
Q2	18,000
Q3	22,000
Q4	20,000
Total Revenue	75,000
Average Quarterly Revenue	18,750

Contrastive CoT Prompting

- *Contrastive Chain-of-Thought (Contrastive CoT) prompting is a technique where the AI is guided to explore different perspectives or approaches to a problem before arriving at a conclusion.*

Contrastive CoT Prompting

Example Scenario: Ethical Dilemma

Problem: "Should autonomous cars prioritize the safety of their passengers over pedestrians in an unavoidable accident scenario?"



Contrastive CoT Prompting

Contrastive CoT Prompting:

1. Perspective 1: Prioritize Passenger Safety

Chain of Thought:

- Autonomous cars are designed to protect their occupants.
- Passengers have entrusted their safety to the vehicle, expecting it to protect them.
- Prioritizing passenger safety may encourage broader acceptance and trust in autonomous technology.

Conclusion:

"Autonomous cars should prioritize the safety of their passengers as they are responsible for those inside the vehicle who have placed their trust in the technology."

2. Perspective 2: Prioritize Pedestrian Safety

Chain of Thought:

- Pedestrians are more vulnerable as they do not have the protective environment of a car.
- Ethical frameworks, such as the utilitarian approach, may argue for minimizing overall harm, potentially saving more lives by protecting pedestrians.
- Legal and societal norms often place greater responsibility on drivers (and thus autonomous cars) to avoid harming pedestrians.

Conclusion:

"Autonomous cars should prioritize pedestrian safety as they are more vulnerable and ethical principles often emphasize minimizing harm to those at greater risk."

Contrastive CoT Prompting

3. Combined Analysis:

- Both perspectives provide valid arguments: protecting passengers ensures trust in technology, while protecting pedestrians aligns with minimizing harm and societal norms.
- A balanced approach might involve optimizing the car's decision-making to consider factors such as the number of lives at risk, the severity of potential injuries, and the immediate context of the accident.

Final Response:

"In the event of an unavoidable accident, autonomous cars should aim to minimize overall harm by considering both passenger and pedestrian safety. This balanced approach ensures the protection of vulnerable individuals while maintaining trust in autonomous technology."

Active Prompting

- *Active prompting involves guiding the language model to actively engage in the conversation or task by providing specific instructions or cues that direct its responses towards a desired outcome.*

Active Prompting

Example Scenario: Customer Support Chatbot

Active Prompting:

1. **Initial Prompt:** "You are a customer support chatbot for an online electronics store. A customer asks about returning a faulty product."
2. **Active Guidance:**
"Provide clear instructions on how the customer can initiate a return and what information they need to provide."
3. **Response:**
"Hello! I'm sorry to hear that you're experiencing issues with your product. To initiate a return, please visit our website and go to the 'Returns' section. You'll need your order number and a brief description of the issue. Once submitted, our team will review your request and provide further instructions."

Memory of thought Prompting

- *Memory-of-Thought (MoT) prompting refers to a technique where AI language models are encouraged to recall previous interactions or information from ongoing conversations to maintain context and coherence.*

Memory of thought Prompting

Example Scenario: Continued Conversation

Memory-of-Thought Prompting:

1. Initial Interaction:

User: "I'm planning a trip to Paris next month. Any recommendations for must-see attractions?"

Model Response: "Certainly! You should definitely visit the Eiffel Tower for its iconic views of the city. The Louvre Museum is also a must-see for its impressive art collection."

2. Subsequent Interaction:

User: "Thanks for the suggestions! What about good places to eat near the Eiffel Tower?"

Memory-of-Thought Prompting:

"Based on your interest in Paris, here are some restaurants near the Eiffel Tower: Le Jules Verne, 58 Tour Eiffel, and Café de l'Homme. Each offers a unique dining experience with views of the tower."

Ensambling

Ensembling

- *In GenerativeAI, ensembling is the process of using multiple prompts to solve the same problem, then aggregating these responses into a final output.*

Demonstration Ensembling

- *Demonstration Ensembling (DENSE) is a technique used in machine learning and AI, particularly in natural language processing (NLP), where multiple models or demonstrations are combined or "ensembled" to improve the overall performance or robustness of a system*

Demonstration Ensembling

Example Scenario: Language Understanding and Generation

Problem: Enhancing a chatbot's ability to understand and respond to user queries effectively.

Demonstration Ensembling (DENSE) Example:

1. Individual Model Demonstrations:

- **Model 1:** Focuses on understanding specific domain-specific queries, such as customer support inquiries.
- **Model 2:** Excels in generating natural and engaging responses in casual conversation.
- **Model 3:** Specializes in handling technical queries with precise and accurate information.

Demonstration Ensembling

Example Interaction:

User: "I'm having trouble with my internet connection. Can you help?"

DENSE Response: "Sure! It sounds like you might be experiencing issues with your internet connection. Have you tried restarting your router? If that doesn't work, contacting your internet service provider for assistance would be the next step."

Prompt Paraphrasing

- *Transforms an original prompt by changing some of the wording, while still maintaining the overall meaning. It is effectively a data augmentation technique that can be used to generate prompts for an ensemble.*

Original Prompt: "What are the main causes of climate change?"

Paraphrased Prompt: "Could you explain the primary factors contributing to global warming?"

Self Criticism

- *When creating GenAI systems, it can be useful to have LLMs criticize their own outputs (Huang et al., 2022). This could simply be a judgement (e.g., is this output correct) or the LLM could be prompted to provide feedback, which is then used to improve the answer.*

Initial Response: "What is your favorite color?"

Self-Criticism Evaluation:

- **Evaluation Criteria:** Check for relevance, clarity, and naturalness of the response.
- **Critique:** The response lacks engagement as it is too straightforward and doesn't encourage further conversation.

Revised Response: "I'd love to hear about your favorite color! Mine is sky blue. What about you?"

Self Refine

- *Self-refine refers to a process where an AI model autonomously improves its own performance or capabilities over time through iterative learning and adaptation. This self-improvement can involve various techniques such as reinforcement learning, continuous training on new data, or adjusting internal parameters based on feedback.*

Prompt Engineering

Auto Prompt

- *AutoPrompt refers to a technique where AI language models automatically generate prompts or queries to guide their own generation of responses.*

Auto Prompt

1. Initial Setup:

- The AI language model is tasked with creating unique short stories based on different themes, such as "adventure," "mystery," or "romance."

2. AutoPrompt Generation:

- Theme: Adventure
 - **AutoPrompt:** "Write a thrilling adventure story involving a treasure hunt in a remote jungle."
- Theme: Mystery
 - **AutoPrompt:** "Craft a suspenseful mystery tale about a detective solving a perplexing murder case in a small town."

Answer Engineering

Answer Shape
Answer Space
Answer Extractor

Answer Shape

- *Answer Shape" refers to the structure or format in which answers are presented or engineered to best suit the intended use case or application.*

Answer Shape

1. Question: "What year did World War II end?"

2. Answer Shapes:

- Simple Text Response:
 - Answer: "World War II ended in 1945."
 - Shape: A straightforward text response providing the exact year of the event.
- Extended Contextual Response:
 - Answer: "World War II officially ended on September 2, 1945, with the signing of the Japanese Instrument of Surrender aboard the USS Missouri in Tokyo Bay."
 - Shape: A detailed response that includes additional context and historical details about the event.

Formatted Answer with Key Details:

- Answer:

vbnet

Copy code

```
Event: World War II
End Date: September 2, 1945
Location: Tokyo Bay
Details: Japanese surrender aboard the USS Missouri
```

- Shape: An answer formatted in a structured layout with key information categorized for easy reference or integration into other systems.

Answer Space

- *"Answer Space" refers to the set of possible responses that an AI system can generate for a given query. It encompasses all potential answers, taking into account the context, relevance, and variability of the responses.*

Answer Space

Question: "How do I reset my password?"

Answer Space Example:

1. Defining the Answer Space:

- The answer space for this question should include various possible ways to reset a password, while ensuring that all responses are accurate, secure, and easy to follow.

2. Examples of Responses within the Answer Space:

- **Standard Procedure:**

- **Answer:** "To reset your password, go to the login page and click on 'Forgot Password.' Enter your email address, and we'll send you a link to reset your password."

- **Security Considerations:**

- **Answer:** "To reset your password securely, please visit our login page and click 'Forgot Password.' Follow the instructions sent to your registered email address to create a new password. Ensure your new password is strong and unique."

- **Mobile App Instructions:**

- **Answer:** "To reset your password using our mobile app, open the app and go to the login screen. Tap on 'Forgot Password' and enter your email address. Follow the link

Answer Extractor

- *An Answer Extractor is a component or tool in natural language processing (NLP) systems designed to identify and extract specific pieces of information or answers from a given text.*

Answer Extractor

1. User Query: "What are the benefits of regular exercise?"

2. Source Text:

- "Regular exercise offers numerous benefits, including improving cardiovascular health, enhancing muscle strength, reducing stress, and boosting mental well-being. Additionally, it helps in maintaining a healthy weight, improving sleep quality, and increasing overall energy levels."

3. Answer Extractor Process:

- **Step 1:** The system processes the user query to understand the specific information being requested.
- **Step 2:** The Answer Extractor scans the source text to identify sentences or phrases that directly address the query.
- **Step 3:** The relevant portions of the text are extracted and presented as the answer.

Beyond English Text Prompting

Multilingual

- *Multilingual refers to the capability of a system, especially in the context of natural language processing (NLP) and artificial intelligence (AI), to understand, process, and generate text in multiple languages.*

English: "How can I reset my password?"

Spanish: "¿Cómo puedo restablecer mi contraseña?"

French: "Comment puis-je réinitialiser mon mot de passe?"

Multimodal

- *Process and integrate information from different types of data like*
 - ✓ *Text*
 - ✓ *Images*
 - ✓ *Audio*
 - ✓ *Video*

Image Prompting

Image Prompting refers to the technique of using images as inputs to guide or augment the responses of a language model. This can be used in various applications, such as generating

- 1. descriptive text*
- 2. answering questions about the image*
- 3. creating stories based on the visual content*

Image Prompting



Give description about this image

The image shows a ginger cat with a collar walking on green grass in a garden. The cat appears to be outdoors on a sunny day, as indicated by the bright lighting and the shadows on the grass. The background includes blurred greenery, suggesting trees or bushes. The cat is captured in mid-step, giving a sense of motion and exploration. The vibrant green grass and the orange hue of the cat's fur create a pleasing contrast, making the scene appear lively and natural.

Audio Prompting

Audio Prompting refers to the technique of using audio inputs to guide or augment the responses of a language model. This can involve recognizing and understanding

- 1. spoken language*
- 2. Sounds*
- 3. Other auditory information*

And then generating appropriate textual or spoken responses based on this input.

Video Prompting

Video prompting refers to using textual or visual prompts to influence the generation of video content by AI models. This technique leverages pretrained models that can generate realistic video sequences based on the input provided through prompts.

Video Prompting

Text to video Generation

Model: v2.0 ▾

Visit to Eiffel Tower

21/25000

Generate a video ✨

Different filters for video

v2.0 | A Magical Day at the Eiffel Tower!

Audience

Travel Enthusiasts History Buffs Romantics

Look and Feel

Inspirational Bright Clean

Platform

YouTube **Instagram reels** Tiktok

Continue

Reference
<https://shorturl.at/DcnnX>

Video Prompting

AI video generated

