PROMPTING

**1. Zero-shot Prompting**

**Explanation:**  
Zero-shot prompting means asking the AI a question **without giving any prior examples**. The model directly uses its training knowledge to generate the response. This is the simplest and fastest prompting method.

**Example:**

* Prompt: *“Translate ‘How are you?’ into French.”*
* Answer: *“Comment ça va ?”*

**Real-time Example:**

* Asking a chatbot *“Summarize today’s news in 3 lines.”* without any examples.

**Advantages:**

* Very simple, requires no training examples.
* Fast and efficient for general tasks.
* Works well when task is clear.

**Disadvantages:**

* Sometimes inaccurate if the question is ambiguous.
* Cannot handle complex reasoning well.

**When & How to Use:**

* Best for straightforward tasks like **translation, summarization, classification**.
* Use when you want a **quick response** without setup.

**2. Few-shot Prompting**

**Explanation:**  
Few-shot prompting means **providing examples** of how you want the output before asking the question. The model learns from these examples inside the prompt.

**Example:**

Translate English to French:

- Hello → Bonjour

- Good morning → Bonjour

- How are you? → ?

Answer: *“Comment ça va ?”*

**Real-time Example:**

* Training a chatbot:  
  “Classify sentiment:
  + I love this → Positive
  + This is terrible → Negative
  + I feel happy → Positive  
    Now classify: I hate this.”

**Advantages:**

* Increases accuracy compared to zero-shot.
* Helps the AI understand **format + style**.
* Useful for custom tasks.

**Disadvantages:**

* Uses more tokens (expensive in API).
* Still not perfect for very complex logic.

**When & How to Use:**

* Use when you want the AI to **follow a specific style or output format**.
* Ideal for **custom classification, translations, dialogue simulations**.

**3. Chain-of-Thought (CoT) Prompting**

**Explanation:**  
CoT prompting makes the AI **show its reasoning steps** before giving the final answer. Instead of direct answers, it explains the logic.

**Example:**

* Prompt: *“If there are 5 apples and you eat 2, how many left?”*
* CoT Answer:  
  “There are 5 apples. You eat 2. 5 - 2 = 3. Final Answer: 3.”

**Real-time Example:**

* Solving a **math word problem**:  
  *“A train leaves at 3 PM, arrives at 6 PM, travel time?”*  
  → AI explains step by step before giving answer.

**Advantages:**

* Improves accuracy for reasoning tasks.
* Makes the process **transparent** (we can debug AI reasoning).
* Good for education, step-by-step guides.

**Disadvantages:**

* Longer outputs, sometimes unnecessary.
* If reasoning is wrong, final answer also wrong.

**When & How to Use:**

* Use for **math, logical problems, coding, planning**.
* Ask: *“Think step by step.”* to activate CoT.

**4. Meta Prompting**

**Explanation:**  
Meta prompting is when you give the AI **instructions about how to respond**, instead of just asking for content. It’s like telling the AI *how to think, how to act, or how to format*. The prompt itself is about the **behaviour** of the model, not just the task.

**Example:**

* Prompt: *“You are a strict grammar teacher. Correct all my sentences with explanations.”*
* Answer: *“Sentence: ‘He go to school.’ → Correction: ‘He goes to school.’ Explanation: Subject-verb agreement.”*

**Real-time Example:**

* Customer service chatbot: *“Always respond politely, in 2 sentences maximum, and suggest a solution.”*

**Advantages:**

* Gives **control** over style, tone, and personality of the AI.
* Makes responses consistent across tasks.
* Good for **chatbots, role-play, simulations**.

**Disadvantages:**

* If instructions are unclear, AI may get confused.
* May reduce creativity if too restrictive.

**When & How to Use:**

* Use when you want AI to **act as a specific role** (teacher, doctor, assistant).
* Helpful for **chatbot building, education, content generation with rules**.

**5. Self-Consistency Prompting**

**Explanation:**  
Self-consistency is a prompting method where the AI generates **multiple reasoning paths** for the same problem and then selects the most consistent final answer. It reduces errors by comparing possible outputs.

**Example:**

* Prompt: *“A shop sells 3 apples for $6. How much for 9 apples?”*
  + Path 1: 3 → $6 → 9 → $18
  + Path 2: $6 ÷ 3 = $2 each → 9 × 2 = $18
  + Path 3: (6/3) = 2 per apple → 9×2 = $18
* Final Answer: *$18*

**Real-time Example:**

* In exam-style questions (math, reasoning), AI checks its own logic before finalizing answer.

**Advantages:**

* More reliable answers than single-path reasoning.
* Reduces hallucinations.
* Great for **math, reasoning, planning tasks**.

**Disadvantages:**

* Slower (needs multiple reasoning paths).
* Uses more tokens (expensive).

**When & How to Use:**

* Use when **accuracy is critical** (calculations, fact-checking).
* Works best when you ask: *“Show multiple ways and give the most consistent answer.”*

**6. Generate Knowledge Prompting**

**Explanation:**  
This method makes the AI **generate background knowledge first** before solving the task. It improves accuracy because the AI recalls context before answering.

**Example:**

* Task: *“What is the capital of France?”*
* AI Step 1 (knowledge generation): *“France is a country in Europe. Its famous cities are Paris, Lyon, Marseille.”*
* AI Step 2 (answer): *“The capital is Paris.”*

**Real-time Example:**

* Research Assistant:  
  *“First recall the history of AI. Then summarize key achievements in 5 lines.”*

**Advantages:**

* Improves reasoning by building **context step by step**.
* Reduces errors in **knowledge-based tasks**.
* Good for teaching & complex explanations.

**Disadvantages:**

* Longer responses (may repeat known facts).
* If initial knowledge is wrong, final answer also wrong.

**When & How to Use:**

* Use for **history, science, research, explanations**.
* Best when you want detailed **context before conclusion**.

**7. Prompt Chaining**

**Explanation:**  
Prompt chaining means **breaking a big task into smaller prompts** and connecting them step by step. Instead of asking one large question, you design multiple prompts where the output of one becomes the input of the next.

**Example:**

1. Prompt 1: *“Summarize this news article in 3 lines.”*
2. Prompt 2: *“From the summary, list 3 key people involved.”*
3. Prompt 3: *“Write a short biography of those people.”*

**Real-time Example:**

* In a **customer support bot**:
  + Step 1: Understand customer complaint.
  + Step 2: Classify complaint type.
  + Step 3: Suggest a solution.

**Advantages:**

* Handles **complex workflows**.
* Reduces confusion by dividing tasks.
* Makes debugging easier.

**Disadvantages:**

* Slower (multiple steps).
* Needs careful design, otherwise errors propagate.

**When & How to Use:**

* Use when solving **multi-step problems** (research, coding, reports).
* Best for **structured pipelines** like **summarization → classification → action**.

**8. Tree of Thoughts (ToT)**

**Explanation:**  
Tree of Thoughts prompting is like **brainstorming with branches**. Instead of a single reasoning path, the AI explores **multiple possible steps (branches)** and then chooses the best one. It’s like decision trees for reasoning.

**Example:**

* Problem: *“How to improve city traffic?”*
  + Branch 1: Build more roads → costly
  + Branch 2: Promote public transport → eco-friendly
  + Branch 3: Use AI traffic lights → efficient
* AI compares and picks the best.

**Real-time Example:**

* Business planning: AI explores multiple strategies, then recommends the most effective.

**Advantages:**

* Encourages **creative + logical exploration**.
* Finds better solutions than single-path reasoning.
* Great for **decision-making, brainstorming, planning**.

**Disadvantages:**

* Computationally heavy.
* Output may be too long.
* Needs **evaluation step** to select best branch.

**When & How to Use:**

* Use when facing **open-ended or strategic problems**.
* Perfect for **planning, business ideas, writing multiple drafts**.

**9. Retrieval-Augmented Generation (RAG)**

**Explanation:**  
RAG combines **external knowledge retrieval** with AI generation. Instead of only relying on training data, the model fetches facts from a database, API, or documents before answering.

**Example:**

* Task: *“What is the revenue of Tesla in 2024?”*
* AI fetches info from database → *“Tesla revenue in 2024 was $96 billion.”*

**Real-time Example:**

* **Chatbot connected to company documents**: When asked *“What’s the leave policy?”*, it retrieves from HR files and gives an answer.

**Advantages:**

* Reduces hallucination (AI doesn’t guess).
* Keeps answers **updated**.
* Great for enterprise solutions.

**Disadvantages:**

* Needs **database + retriever setup**.
* Slower due to external search.

**When & How to Use:**

* Use when **accuracy & updated knowledge** is critical.
* Perfect for **chatbots, research assistants, customer support**.

**10. Automatic Reasoning and Tool-use**

**Explanation:**  
This method allows AI to **use external tools, APIs, or functions** to solve problems instead of relying only on text generation. The model reasons when to call a tool (e.g., calculator, search engine) and when to answer directly.

**Example:**

* Prompt: *“What is 5678 × 3421?”*
* AI reasoning: *“This is a large calculation. Let me use a calculator tool.”*
* Final Answer: *19,436,338.*

**Real-time Example:**

* A travel chatbot:
  + AI uses an API to check real flight prices.
  + Then suggests: *“Flight from Chennai to Delhi on Oct 10 is ₹5,200.”*

**Advantages:**

* Very powerful (AI is not limited to memory).
* Allows **real-world interaction** (databases, APIs).
* Increases accuracy for complex tasks.

**Disadvantages:**

* Needs proper integration with tools.
* Risky if tools give wrong output.

**When & How to Use:**

* Use when tasks involve **math, APIs, external knowledge**.
* Ideal for **assistants, chatbots, automation systems**.

**11. Automatic Prompt Engineer (APE)**

**Explanation:**  
APE means AI **creates and optimizes its own prompts** automatically. Instead of a human writing the best prompt, the AI experiments and finds the most effective one for the task.

**Example:**

* Task: Sentiment classification.
* AI generates candidate prompts:
  + *“Classify text as positive or negative.”*
  + *“Is the review good or bad?”*
  + *“Label this review with sentiment.”*
* AI tests them and picks the best-performing one.

**Real-time Example:**

* In business: AI can auto-generate the best prompt for **product description writing** without human trial & error.

**Advantages:**

* Saves time (no manual tuning).
* Improves performance automatically.
* Great for scaling AI across tasks.

**Disadvantages:**

* Can be resource-heavy.
* Sometimes generates useless prompts.

**When & How to Use:**

* Use for **large projects where many prompts are needed**.
* Ideal for **automation, optimization, research projects**.

**12. Active-Prompt**

**Explanation:**  
Active-prompting lets the AI **identify where it is uncertain** and ask for clarification before answering. Instead of guessing, it seeks more info.

**Example:**

* User: *“Book a train ticket for Friday.”*
* AI: *“Do you mean Friday this week (Sept 12) or next week (Sept 19)?”*
* After clarification → AI proceeds.

**Real-time Example:**

* In **medical chatbots**:
  + Patient: *“I have pain.”*
  + AI: *“Where exactly is the pain? Head, chest, or stomach?”*

**Advantages:**

* Reduces mistakes from assumptions.
* More natural, **human-like conversation**.
* Great for **sensitive applications** (health, finance).

**Disadvantages:**

* Slower (extra clarification steps).
* Not always needed for simple tasks.

**When & How to Use:**

* Use when ambiguity is high.
* Ideal for **healthcare bots, booking systems, legal assistants**.

**13. Directional Stimulus Prompting**

**Explanation:**  
Directional stimulus prompting guides the AI’s response in a **specific direction** using keywords, phrases, or hints. Instead of giving examples, you use guiding cues like *“focus on benefits,”* *“be optimistic,”* or *“use technical language.”*

**Example:**

* Prompt: *“Explain AI, focusing on its positive impact on jobs.”*
* Answer: *“AI can create new industries, improve efficiency, and assist workers in creative fields…”*

**Real-time Example:**

* Marketing: *“Write an ad for a phone. Focus on camera quality.”*
* AI highlights only the camera features.

**Advantages:**

* Quick way to **steer the answer’s tone or focus**.
* No need to give full examples.
* Flexible for creative tasks.

**Disadvantages:**

* If direction is vague, AI may misinterpret.
* May cause bias (ignores negatives).

**When & How to Use:**

* Use when you want **tone-controlled outputs** (marketing, politics, education).
* Best for **content writing, persuasive speech, ads**.

**14. Program-Aided Language Models (PAL)**

**Explanation:**  
PAL combines **AI with external code execution**. Instead of only generating text, the model writes and executes code (Python, Java, etc.) to solve problems more accurately.

**Example:**

* Prompt: *“What is the average of numbers 12, 45, 67, 89, 100?”*
* AI writes Python code:
* numbers = [12,45,67,89,100]
* print(sum(numbers)/len(numbers))
* Output: *62.6*

**Real-time Example:**

* Data science assistant: AI can generate Python scripts to analyze customer data.

**Advantages:**

* High accuracy (code handles calculations).
* Useful for **automation + data tasks**.
* Combines **natural language + programming**.

**Disadvantages:**

* Needs coding environment.
* Wrong code = wrong results.

**When & How to Use:**

* Use when tasks need **precise calculations, simulations, or data analysis**.
* Great for **developers, data scientists, research**.

**15. ReAct (Reasoning + Acting)**

**Explanation:**  
ReAct prompting combines **step-by-step reasoning** with **actions** (like searching, using tools). The model reasons about the problem and then takes action in cycles until it gets the final answer.

**Example:**

* Task: *“Who is the CEO of Tesla?”*
* AI Reasoning: *“I don’t remember the latest info. I should search the web.”*
* Action: (Searches online)
* Final Answer: *“Elon Musk is the CEO of Tesla (as of 2025).”*

**Real-time Example:**

* AI travel agent:
  + Reasoning: *“The user wants flights. I should check airline APIs.”*
  + Action: Fetches flights.
  + Final Answer: Suggests ticket details.

**Advantages:**

* Dynamic (AI can adapt mid-task).
* More **human-like decision making**.
* Works well with external tools.

**Disadvantages:**

* Complex setup.
* May loop too much if reasoning is wrong.

**When & How to Use:**

* Use when tasks require **thinking + tool use**.
* Ideal for **research, automation, assistants**.

**16. Reflexion**

**Explanation:**  
Reflexion prompting makes AI **reflect on its past responses**, detect mistakes, and improve in the next attempt. It’s like giving the AI a “memory” of errors so it can self-correct.

**Example:**

* First attempt: *“2 + 2 × 5 = 20”* (wrong).
* Reflection: *“I may have ignored operator precedence. Let me recalculate.”*
* Corrected answer: *“2 + (2 × 5) = 12.”*

**Real-time Example:**

* Coding assistant: Writes buggy code, then reviews its own output and fixes the bugs automatically.

**Advantages:**

* Self-improvement without human correction.
* Reduces repeated errors.
* Great for **iterative tasks**.

**Disadvantages:**

* Slower (needs retries).
* If initial reflection is wrong, still fails.

**When & How to Use:**

* Use for **coding, problem-solving, essays, debugging**.
* Best when accuracy improves with self-checks.

**17. Multimodal Chain-of-Thought (Multimodal CoT)**

**Explanation:**  
This method extends **Chain-of-Thought** into **multiple input types** (text + images, audio, video). AI reasons step by step using different modalities.

**Example:**

* Input: Image of a bar chart + question: *“What is the highest value?”*
* AI reasoning: *“The chart has 5 bars, the tallest is the 4th with 80.”*
* Final Answer: *“80 is the highest value.”*

**Real-time Example:**

* Medical AI: Reads an **X-ray image** + patient notes, then explains diagnosis step by step.

**Advantages:**

* Handles complex **multi-input problems**.
* More powerful than text-only reasoning.
* Useful for real-world applications.

**Disadvantages:**

* Needs multimodal model support.
* Slower than single-mode prompts.

**When & How to Use:**

* Use when working with **images, videos, audio + text together**.
* Perfect for **education, healthcare, data analysis, accessibility tools**.

**18. Graph Prompting**

**Explanation:**  
Graph prompting structures AI reasoning as a **graph (nodes + edges)** instead of plain text. Each node represents a step or idea, and edges show relationships. This improves organization and decision-making.

**Example:**

* Task: *“Plan a wedding.”*
  + Node 1: Venue
  + Node 2: Food
  + Node 3: Guests
  + Node 4: Decoration
  + Edges: Guest count → affects venue & food.

**Real-time Example:**

* In **project management**, AI creates dependency graphs: Task A → Task B → Task C.

**Advantages:**

* Very structured and logical.
* Helps in **complex planning**.
* Easy to visualize relationships.

**Disadvantages:**

* More complex than linear text prompts.
* Needs graph representation tools.

**When & How to Use:**

* Use for **planning, workflows, dependency analysis**.
* Best in **project management, research, knowledge graphs**.