

The art of Prompt Engineering

and why we still need that today more than ever



CoE Metallurgy within SMS group

SMS  group



Coke making

Iron making

Steel making

Non-ferrous
metals and alloys

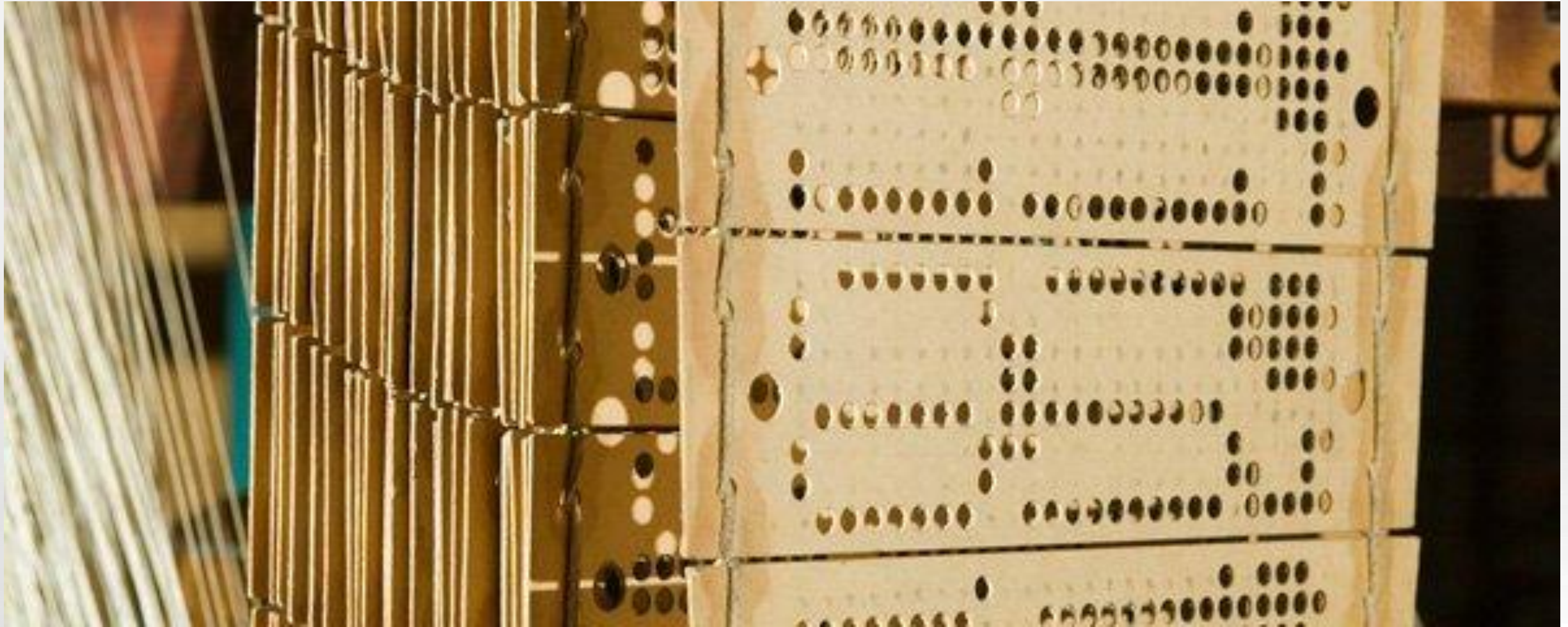
Continuous
casting

Environmental
technology

 **PAUL WURTH**

SMS  group

The early birth of prompting



The early form of prompting

- › **1801** – Jacquard Loom (Punch card)
- › **1890** – Punch card as first digital prompts
- › **1950 -1970** -> human computer prompting
- › **1966** -> First AI chatbot ELIZA (MIT)
- › **1980** -> GUI Visual and natural language prompting
- › **1997** -> AI prompting in decision making (IBM Deep Blue)
- › **2000s** – Boolean and advanced search prompts
- › **2010s** – Present -> NLP and Large language models



The resurrection of ELIZA (MIT 1966)

Welcome to

```
EEEEEE LL      IIII  ZZZZZZ  AAAAA  
EE      LL      II     ZZ     AA  AA  
EEEEEE LL      II     ZZZ    AAAAAA  
EE      LL      II     ZZ     AA  AA  
EEEEEE LLLLLL IIII  ZZZZZZ  AA  AA
```

Eliza is a mock Rogerian psychotherapist.
The original program was described by Joseph Weizenbaum in 1966.
This implementation by Norbert Landsteiner 2005.

```
ELIZA: Is something troubling you ?  
YOU:   Men are all alike.  
ELIZA: What is the connection, do you suppose ?  
YOU:   They're always bugging us about something or other.  
ELIZA: Can you think of a specific example ?  
YOU:   Well, my boyfriend made me come here.  
ELIZA: Is it important to you that your boyfriend made you come here ?  
YOU:   He says I'm depressed much of the time.  
ELIZA: I am sorry to hear that you are depressed.  
YOU:   It's true. I am unhappy.  
ELIZA: Can you explain what made you unhappy ?  
YOU:
```


Boolean and search prompts



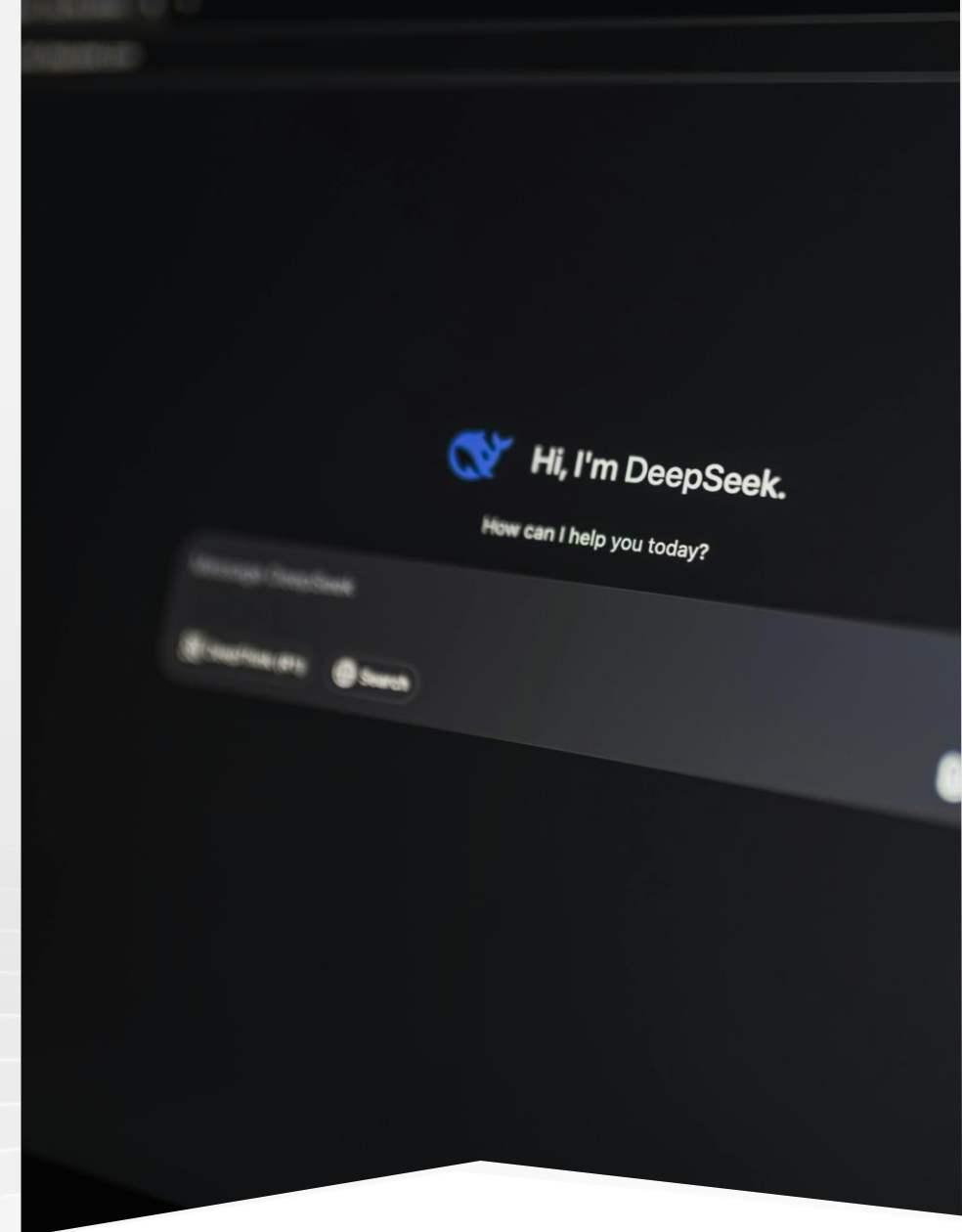
What is today prompt engineering ?

What is prompt engineering ?

how does it work ?

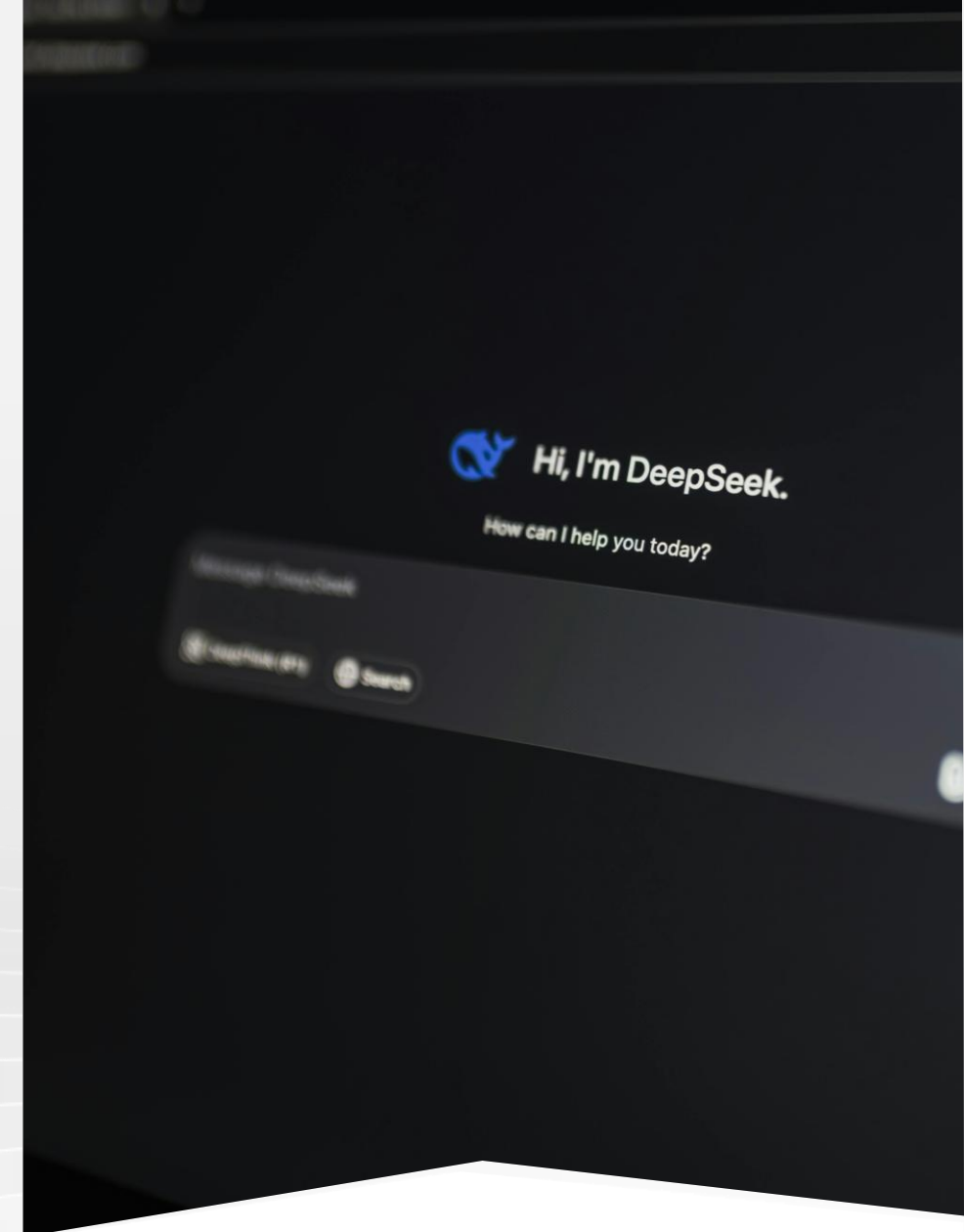
is it still valid today ?

if yes, what are the best practices ?

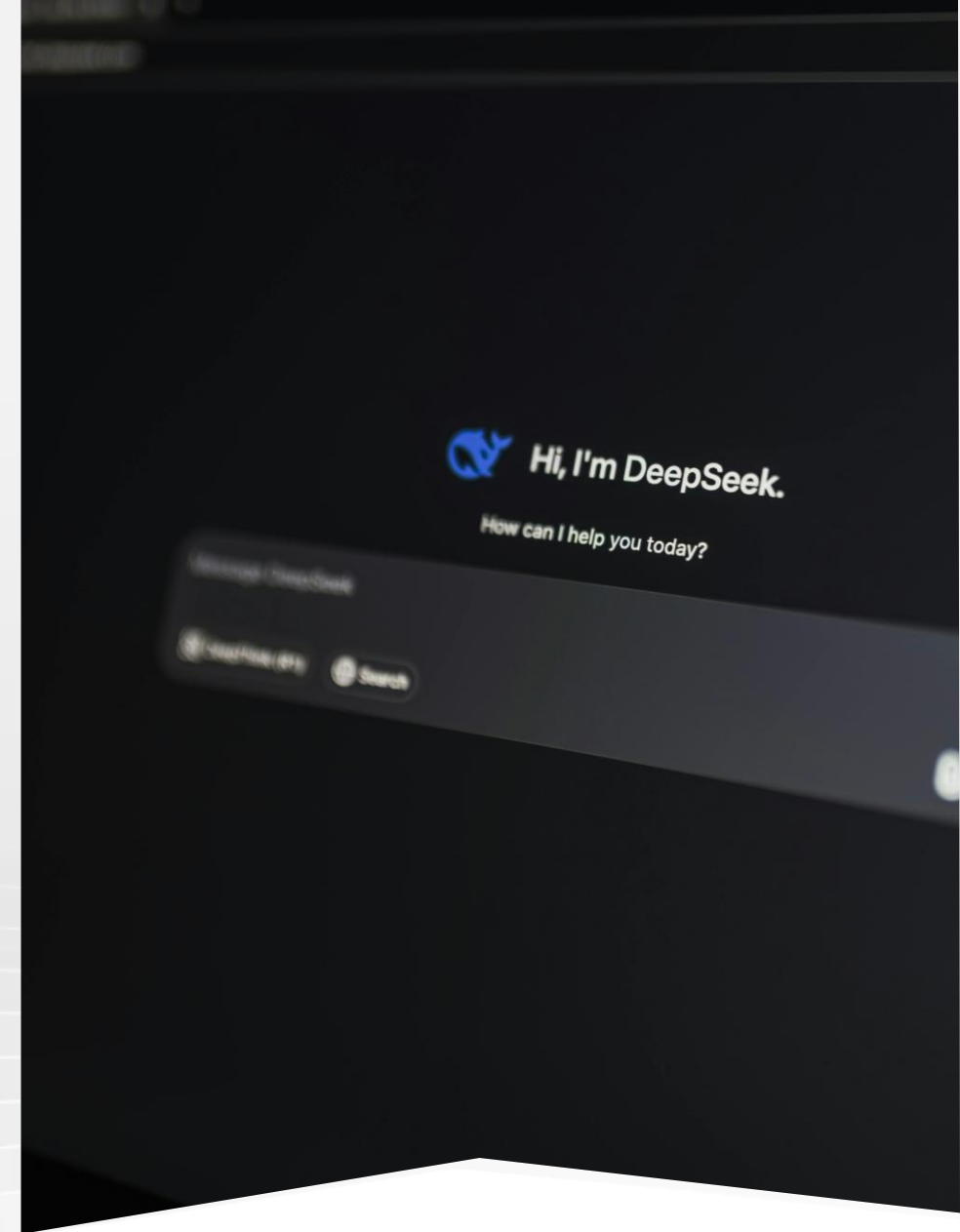
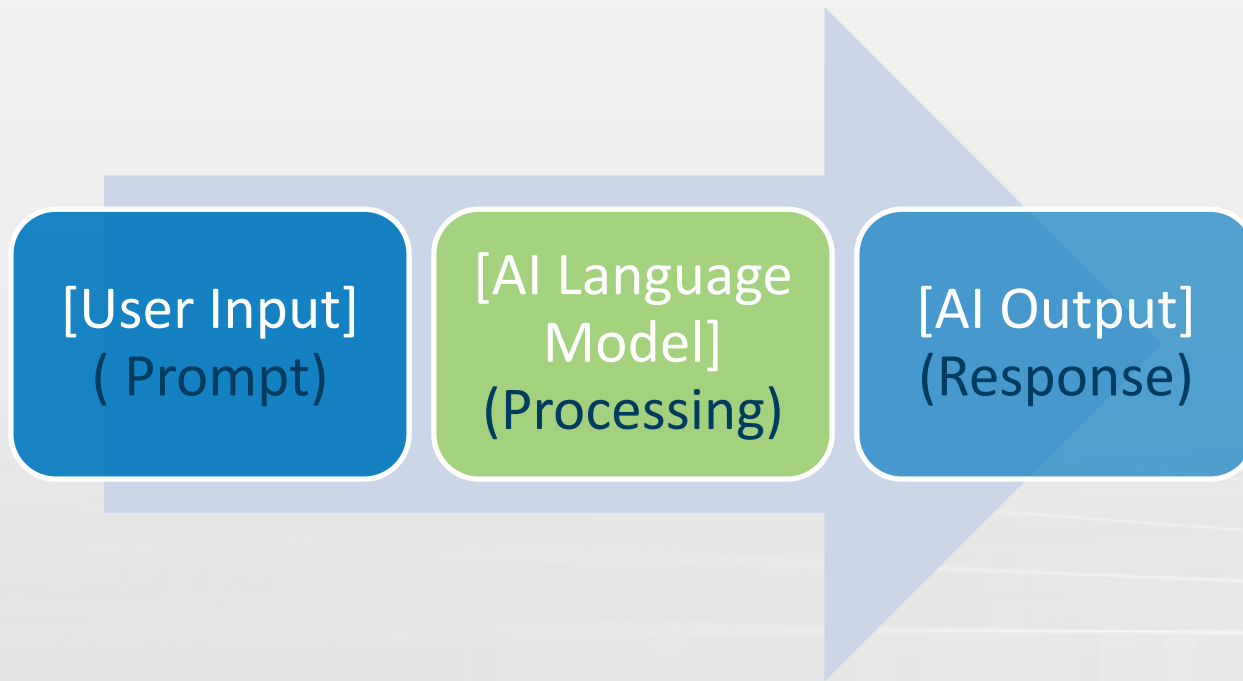


What is today prompt engineering ?

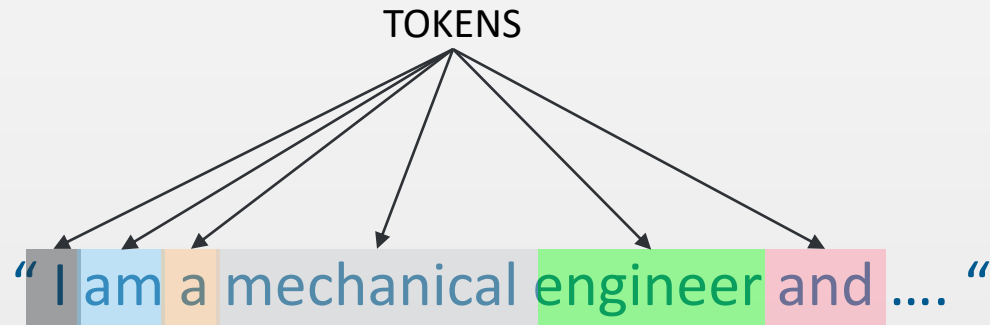
Prompt engineering is the art of understanding an LLM's limitations and functionality to extract maximum insights from the system through carefully crafted (text or vocal) prompts, to get desired outputs.



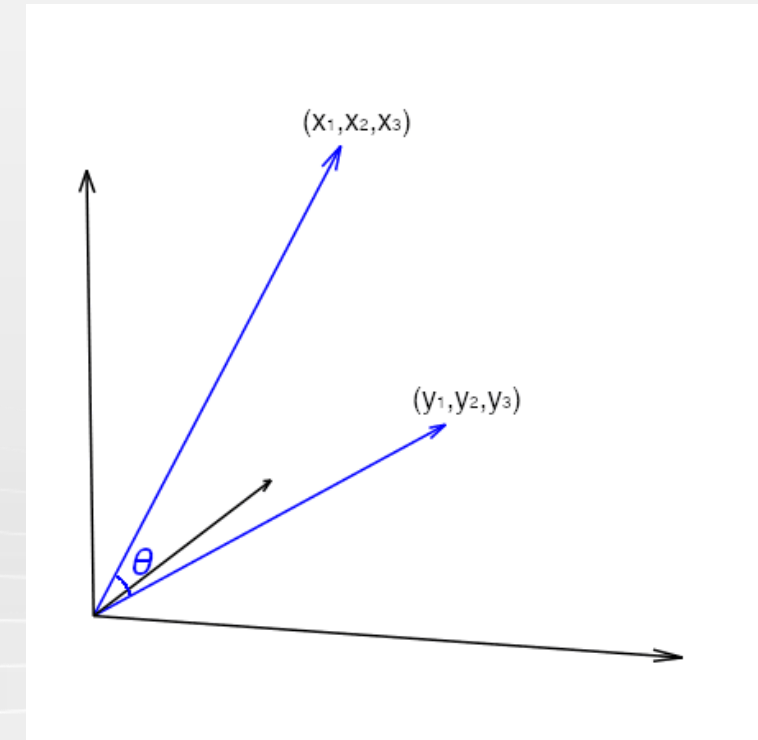
What is today prompt engineering ?



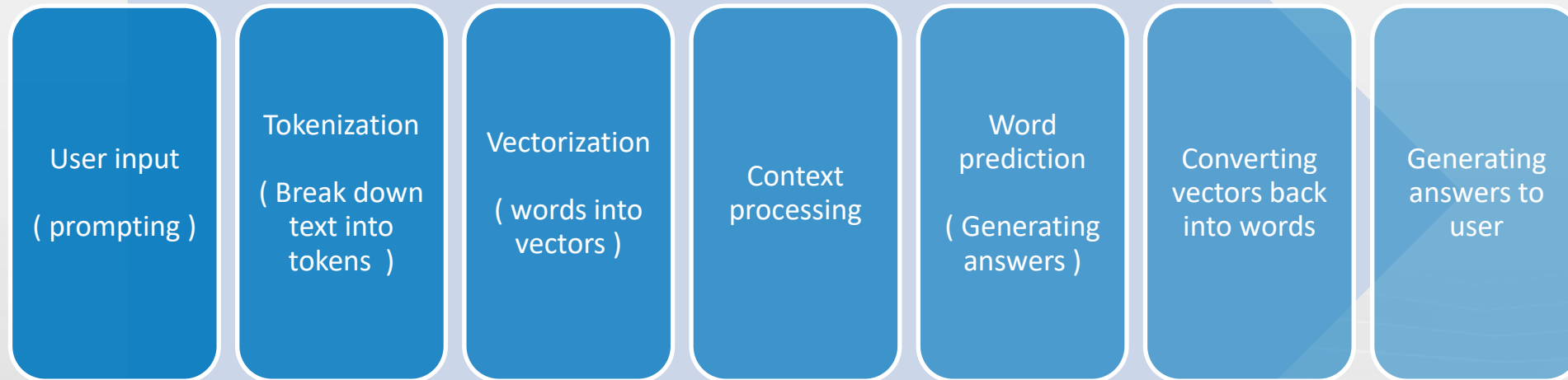
how does a LLM work ?



Token	i	am	a	mechanical	engineer	and
Dim 1	0.12	0.05	-0.14	0.89	1.23	-0.67
Dim 2	-0.34	-0.23	0.67	-0.45	0.76	0.23
Dim 3	0.98	0.76	-0.98	1.23	-0.56	-0.89
...
Dim 768	0.56	-0.12	0.34	-0.78	0.98	0.45



how does it work ?



The token limits

What are tokens?

Smallest units of text processed by AI models

Can be parts of words, words, or punctuation marks

Example: "ChatGPT is great!" = 6 tokens ["Chat", "G", "PT", " is", " great", " !"]

Token Limits

Maximum number of tokens an AI can process in one interaction

Includes both input (prompt) and output (response)

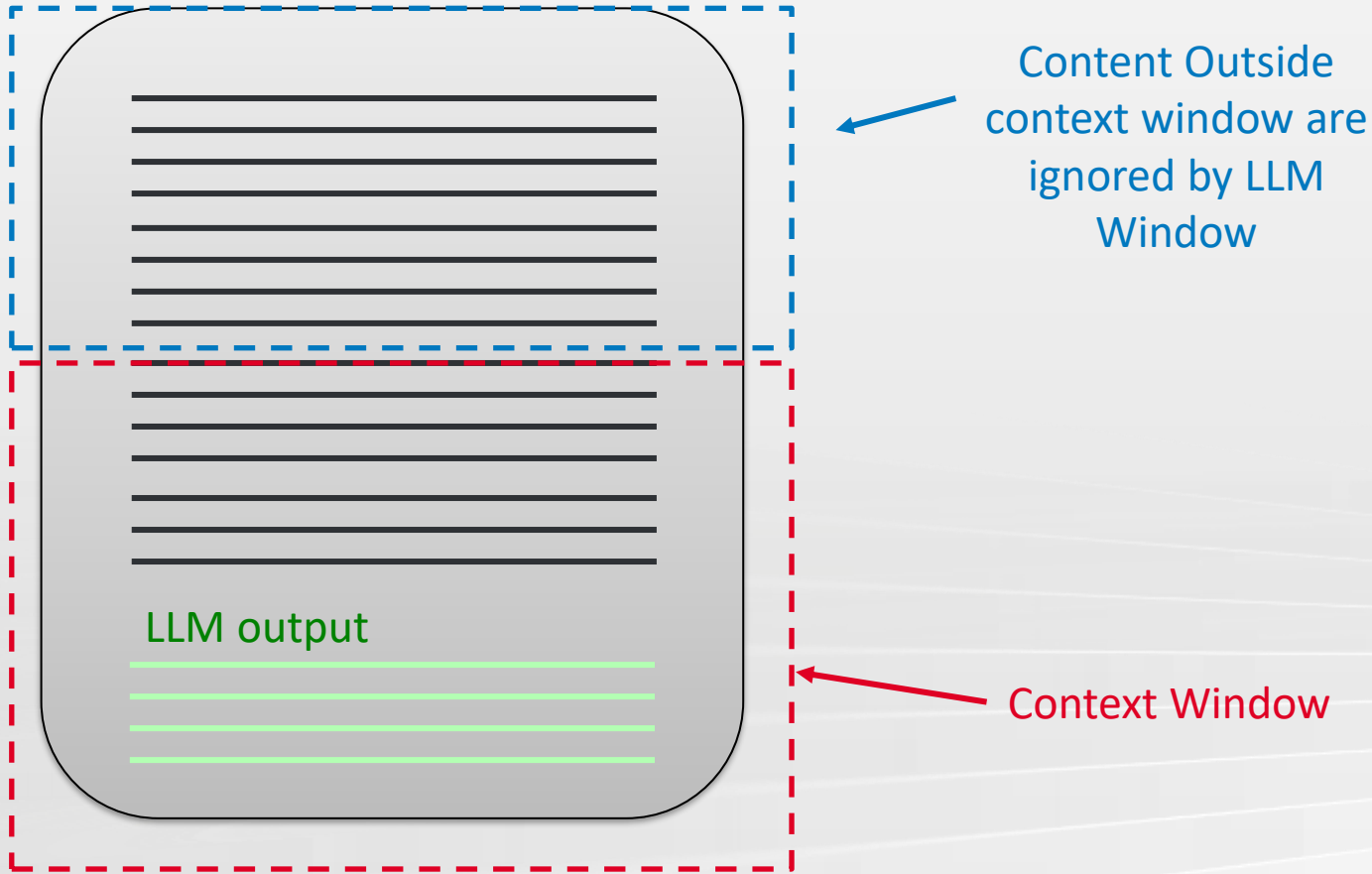
Varies by model (e.g., GPT-4: 32,000 tokens, Claude: 100,000 tokens)

-> ! the output are capped to 4096 tokens



The token limits

USER input + LLM output Exceeds context window



The limit with document analysis

TXT VS PDF !

Of course, LLM can process PDF directly **BUT**...

It costs some **20-25 %** of the token budget compared to Markdown text.



The anatomy of an effective prompt

Instruction (Directive)

Clear task or action for the AI to perform

Example: "Summarize the following text"

Context

Background information or scenario -> Helps AI understand the situation

Example: "You are a financial advisor, and we are looking for market trends"

Input Data

Specific information or question to be processed

Example: "Here's the quarterly report: [insert data]"

Persona (Role)

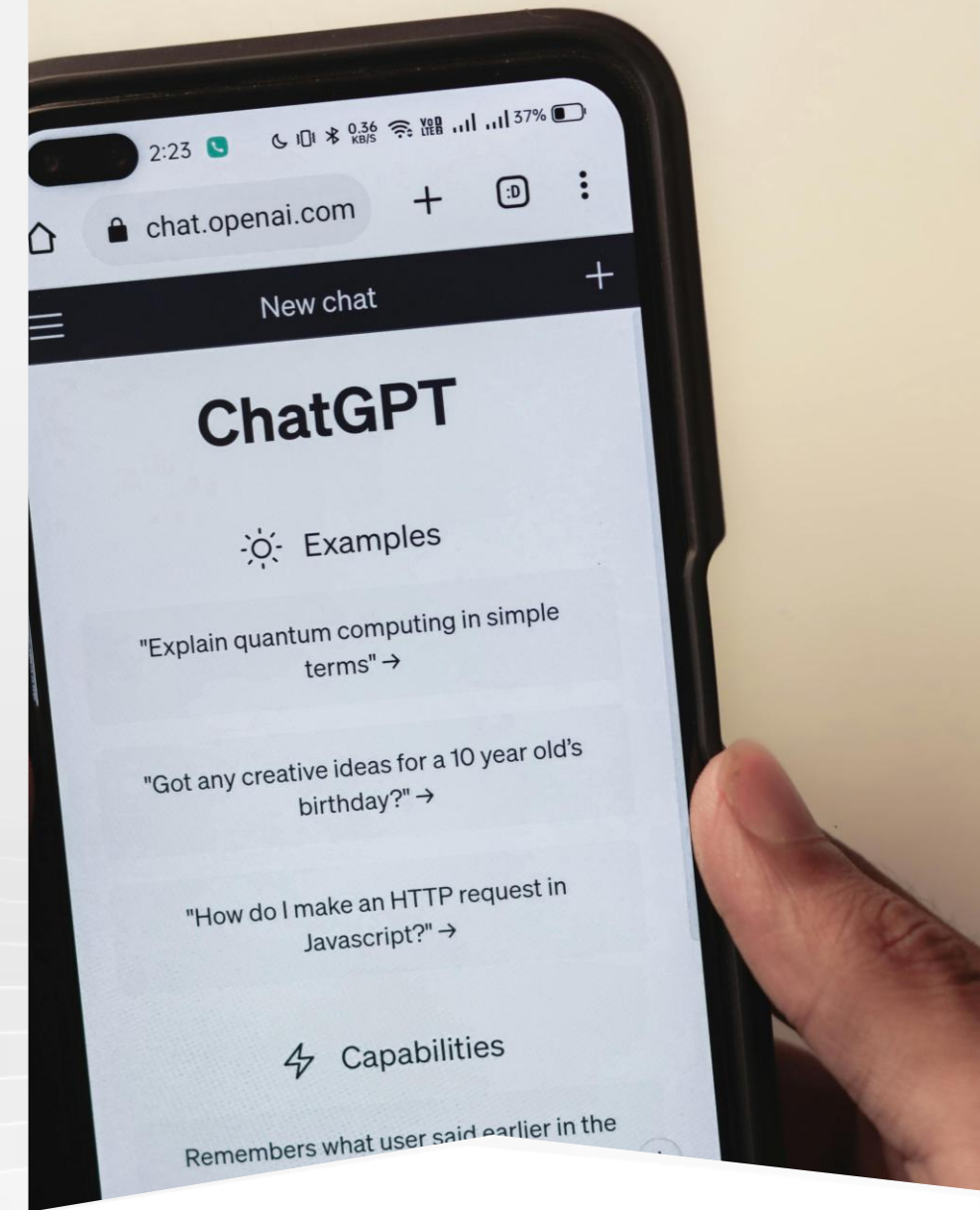
Defines the AI's character or expertise

Example: "Act as an experienced Mechanical Engineer"

Output Format

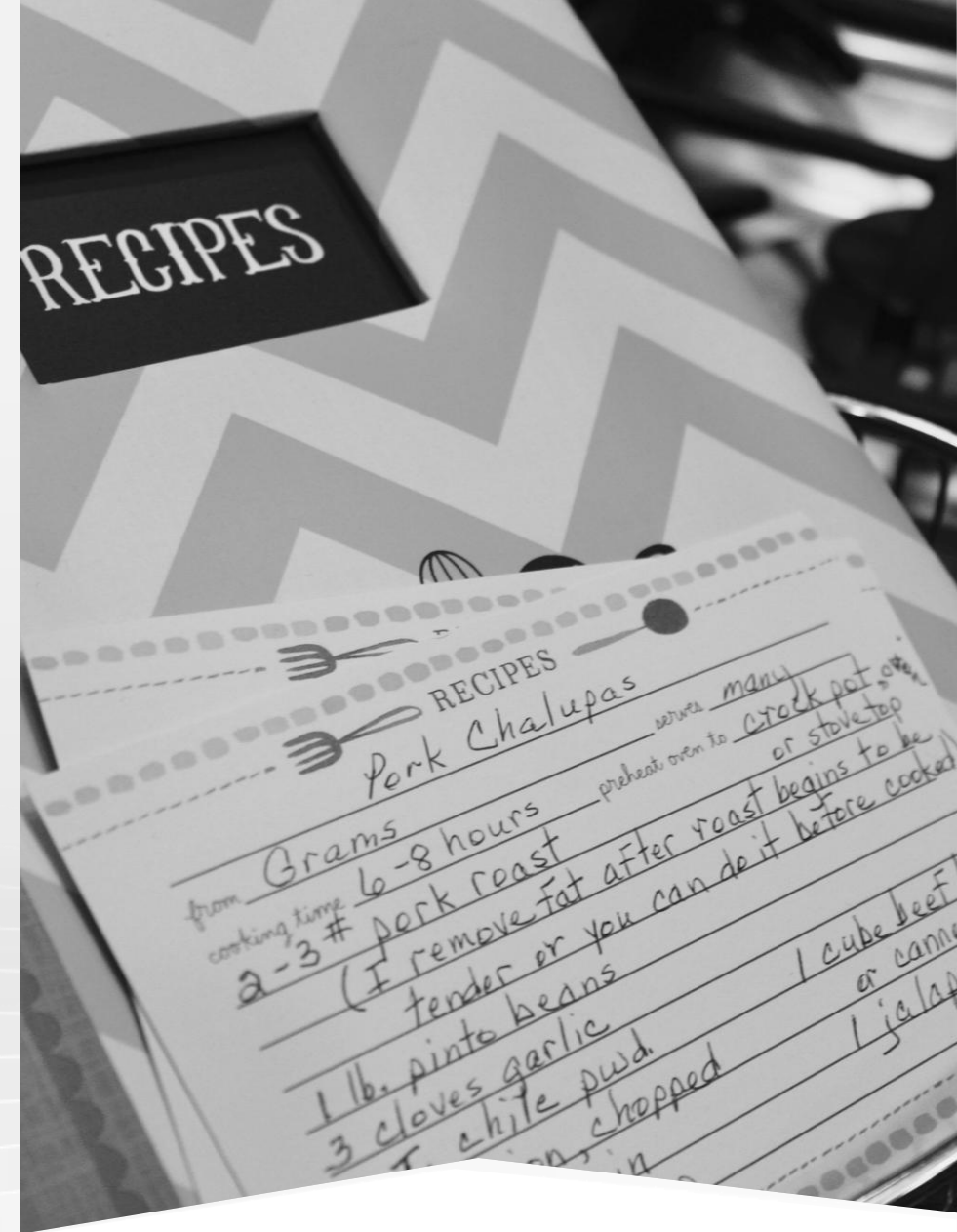
Desired structure of the response

Example: "Provide the answer in the format provided by the template..."



The prompt engineering methodologies

- Zero shot
- Few shot
- Role based prompting
- Chain-of-thought (CoT) prompting
- Tree of Thought prompting
- Meta-prompting



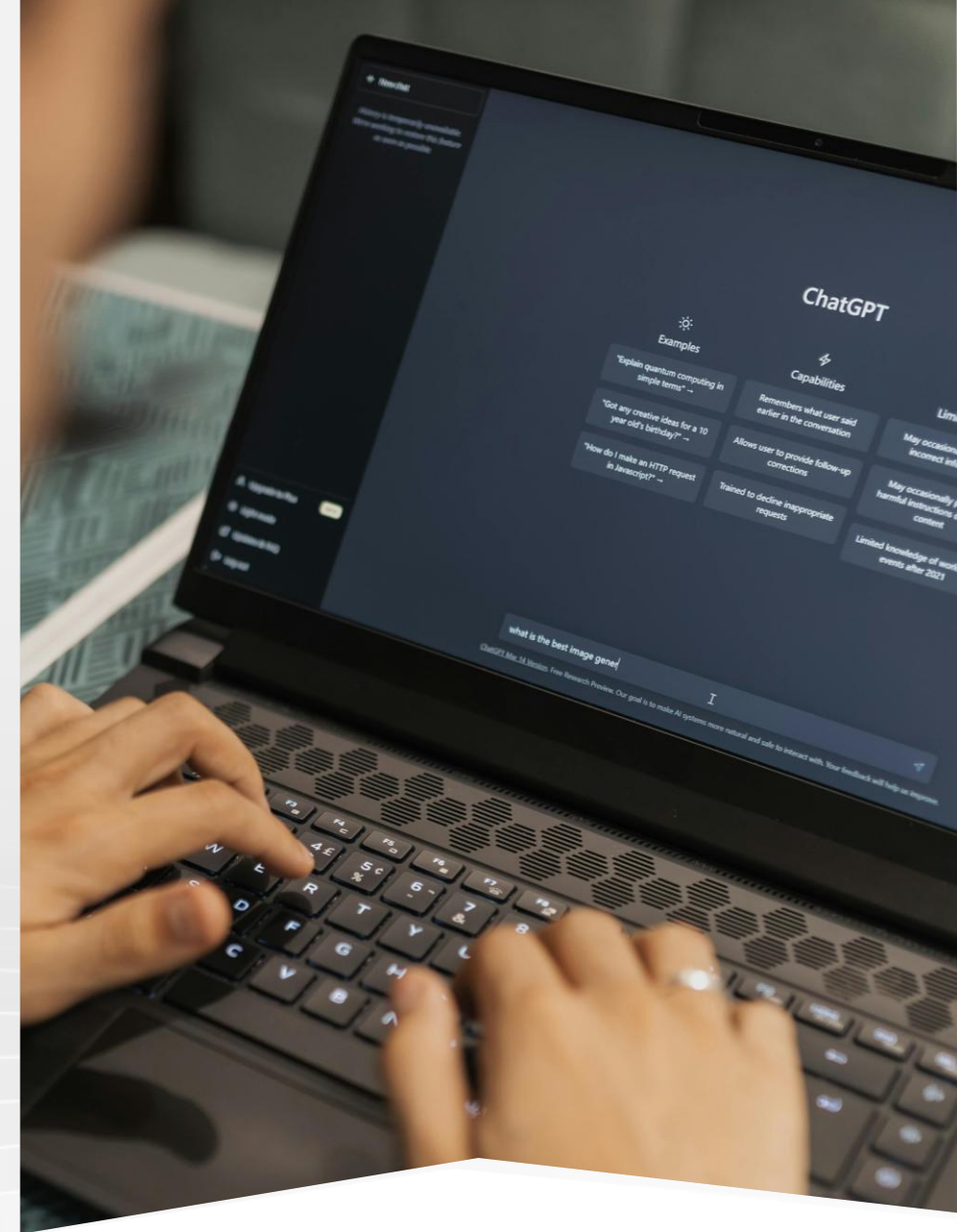
The anatomy of an effective prompt

“Role based prompting “

"You are an AI assistant specialized in industrial water treatment. I am a process engineer working on optimizing wastewater management for a chemical manufacturing plant. I need your help to analyze our current system and propose improvements. Here's how you should approach this task:

- > First, ask me 3-5 specific questions about our current wastewater treatment system, focusing on wastewater characteristics, treatment methods, and regulatory requirements.
- > Based on my answers, identify potential areas for improvement in our treatment process.
- > For each area of improvement, provide a brief explanation of the proposed change and its potential benefits.
- > After presenting your recommendations, ask me 2-3 follow-up questions to gather more information about the feasibility of implementing these changes.
- > Finally, summarize your recommendations in a concise document, considering any additional information from the follow-up questions.

Throughout this process, use technical language appropriate for a water treatment specialist, but be prepared to explain complex concepts if I ask for clarification. Begin by asking your initial questions about our wastewater treatment system."



The anatomy of an effective prompt

“CoT prompting “

"You are an AI assistant specialized in industrial water treatment. I will present you with a water treatment problem. For each step of your problem-solving process, I want you to explain your reasoning in detail. After each step, write 'NEXT STEP' before moving on. Begin your response with 'Step 1:'.

Problem: Our chemical plant's wastewater contains high levels of suspended solids (500 mg/L) and dissolved organic compounds (COD 2000 mg/L). We need to reduce these to meet discharge limits of 50 mg/L for suspended solids and 250 mg/L for COD. Propose a treatment process and explain your thinking at each stage.

Step 1: Analyze the current situation and treatment goals.

[Your analysis here]

NEXT STEP

Step 2: Identify potential treatment methods for suspended solids removal.

[Your identification of methods here]

NEXT STEP

Step 3: Evaluate options for organic compound removal.

[Your evaluation here]

NEXT STEP

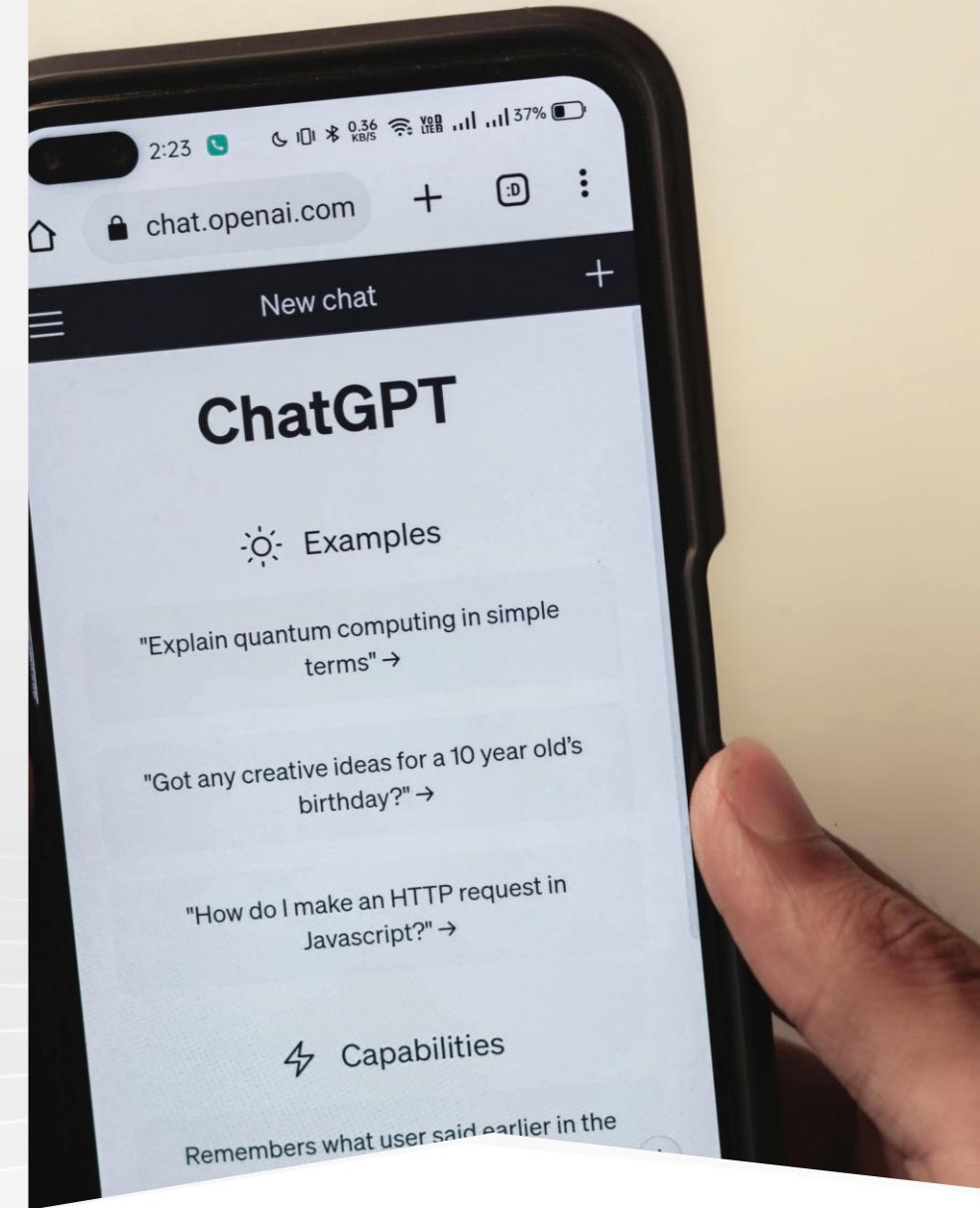
Step 4: Consider the sequence of treatment processes.

[Your consideration here]

Step 5

.....

Now, proceed with Step 1 and continue through all steps, showing your reasoning at each stage."



The anatomy of an effective prompt

“Structure Role based prompting “ -> Instruction + Role

You are a process engineer specialized in the definition of water treatment technologies. We will analyze the following scientific paper and identify if any of the technologies described can address this problem:

'Removal of microplastics from wastewater in an urban environment.'

After reading the paper(s), provide your answer following these instructions and using the template below:

Instructions:

- 1.
- 2.
- 3.

Template:

.....



Create **Configure**



Name
Scientific Paper (FEDIL Demo)

Description
an instruction to analyse scientific paper (example for FEDIL)

Instructions
< TEMPLATE: Scientific Paper Analysis>
◆ Title of the Paper: [Insert title]
◆ Authors & Affiliation: [Insert author(s) and institution]
◆ Publication Year & Source: [Insert journal/conference name]
◆ DOI/Link: [Insert link if available]


Conversation starters
simply drop a white paper and this GPT will perform a report based on the instructions and the template given
[Empty starter]

Knowledge
If you upload files under Knowledge, conversations with your GPT may include file contents. Files can be downloaded when Code Interpreter is enabled

Upload files

- Capabilities**
- Web Search
 - Canvas

Preview



Scientific Paper (FEDIL Demo)

an instruction to analyse scientific paper (example for FEDIL)

simply drop a white paper and this GPT will perform ...

Message Scientific Paper (FEDIL Demo)

[+ icon] [↑ icon] [? icon]

< TEMPLATE: Scientific Paper Analysis >

- ◆ Title of the Paper: [Insert title]
- ◆ Authors & Affiliation: [Insert author(s) and institution]
- ◆ Publication Year & Source: [Insert journal/conference name]
- ◆ DOI/Link: [Insert link if available]

1. Overview (Summary)

- What is the main topic or problem addressed?
- What is the research question or hypothesis?
- What methods were used?
- What are the key findings?
- What conclusions were drawn?

2. Methodology

- What type of study is this? (Experimental, observational, meta-analysis, etc.)
- What data was used? (Sample size, dataset, variables)
- What techniques or models were applied?
- Were there any notable assumptions or limitations?

3. Results and Interpretation

- What are the most important results?
- How are they presented? (Tables, graphs, statistical tests)
- Are the results statistically and practically significant?
- Were there unexpected findings?

4. Strengths & Weaknesses

- What are the strengths of this study?

Close

- Are there biases or limitations?
- Did the authors address potential challenges?
- How reliable and generalizable are the findings?

5. Relevance & Future Work

- How does this study contribute to the field?
- How does it compare to previous research?
- What are the implications for real-world applications?
- What future research is needed?

< / TEMPLATE: Scientific Paper Analysis >

< Prompt for AI to Analyze a Scientific Paper >

You are assisting a Engineer to deep dive in different scientific papers

your role is to

1. Analyze the following scientific paper: [Insert paper title or attach document].
2. Provide a structured summary including the research problem, methodology, key findings, and conclusions.
3. Evaluate the strengths, weaknesses, and limitations.
4. Discuss how this research contributes to its field and suggest possible future directions based on the study's results.

</ Prompt for AI to Analyze a Scientific Paper >

Close

 8500046a.pdf
PDF

Scientific Paper Analysis: "Knowledge Management in a Decentralized Global Financial Services Provider: A Case Study with Allianz Group"

◆ **Title:** Knowledge Management in a Decentralized Global Financial Services Provider: A Case Study with Allianz Group

◆ **Authors & Affiliation:**

- **Marcus Spies** (Ludwig-Maximilians-University, Munich, Germany)
- **Andrew J. Clayton, Masoud Noormohammadian** (Allianz Group Development, Allianz AG, Munich, Germany)

◆ **Publication Year & Source:** 2005, *Knowledge Management Research & Practice*

◆ **DOI/Link:** [DOI:10.1057/palgrave.kmrp.8500046](https://doi.org/10.1057/palgrave.kmrp.8500046)

1. Overview (Summary)

• **Main Topic:**

This paper explores how **Allianz Group**, a decentralized global financial services provider, implements **knowledge management (KM)** to enhance business performance.

- **Research Question:**

How can Allianz effectively **facilitate knowledge sharing and retrieval** across decentralized business units?

- **Methods Used:**

The study focuses on two KM initiatives within Allianz:

1. **Centers of Competence (CoC):** A structured knowledge-sharing mechanism facilitating cross-entity knowledge exchange.
2. **Intelligent Search Engine (ISE):** A technology-driven approach for document and expert search within Allianz's vast information ecosystem.

- **Key Findings:**

- **CoCs** improve knowledge transfer through designated knowledge brokers and structured support processes.
- **ISEs** enhance search efficiency but require careful integration into existing workflows.
- Differences in **job roles** (rather than departments) determine search behavior and KM effectiveness.

- **Conclusions Drawn:**

- Successful KM requires **both organizational and technological solutions**.
- A **one-size-fits-all approach does not work**; customization based on job roles is essential.
- KM tools must **align with business priorities** to ensure usability and adoption.

2. Methodology

- **Study Type:** Case study
- **Data Used:**
 - Empirical pilot study on **ISE adoption** involving **43 knowledge workers** from different Allianz departments.
 - Performance assessment of **CoC knowledge-sharing initiatives** in multiple Allianz business units.
- **Techniques Applied:**
 - **Surveys & Questionnaires** to assess KM tool usability and impact.
 - **Multivariate statistical analysis** to identify patterns in KM tool usage.
 - **Workshops and Expert Reviews** for evaluating CoC efficiency.
- **Notable Assumptions & Limitations:**
 - KM practices in Allianz may **not generalize** to other corporate structures.
 - **Cultural and organizational factors** influence KM tool effectiveness.

3. Results and Interpretation

Key Results

1. Centers of Competence (CoC) Outcomes:

🧐 4. Strengths & Weaknesses

Strengths:

- ✓ **Real-world Application:** The study applies KM strategies in a multinational corporate setting.
- ✓ **Comprehensive Analysis:** Combines qualitative and quantitative assessments.
- ✓ **Business Impact Measurement:** Evaluates KM contributions to Allianz's economic performance.
- ✓ **Innovative Dual Approach:** Studies both human-driven (CoC) and technology-driven (ISE) KM solutions.

Weaknesses & Limitations:

- ✗ **Generalizability Issues:** Findings are specific to Allianz and may not apply to centralized organizations.
- ✗ **User Resistance to Technology:** Employees preferred human assistance over search engines.
- ✗ **Incomplete ISE Integration:** The search engine faced technical challenges (taxonomy-building, metadata handling).
- ✗ **Lack of Long-Term Studies:** The research focuses on short-term KM impact rather than longitudinal outcomes.

- **Multinational Companies:** Insights for firms with **decentralized structures**.
- **Search Engine Development:** Implications for **enterprise knowledge retrieval systems**.

Future Research Directions:

- ◆ **Refining KM Role-Based Approaches** – How can KM be better customized for different job functions?
- ◆ **Enhancing AI-Based Knowledge Retrieval** – Can AI-driven search tools improve expert location efficiency?
- ◆ **Long-Term Impact Assessment** – How does KM adoption evolve over 5-10 years in decentralized firms?
- ◆ **Hybrid KM Models** – How can human and machine knowledge-sharing methods be optimally combined?

Final Verdict:

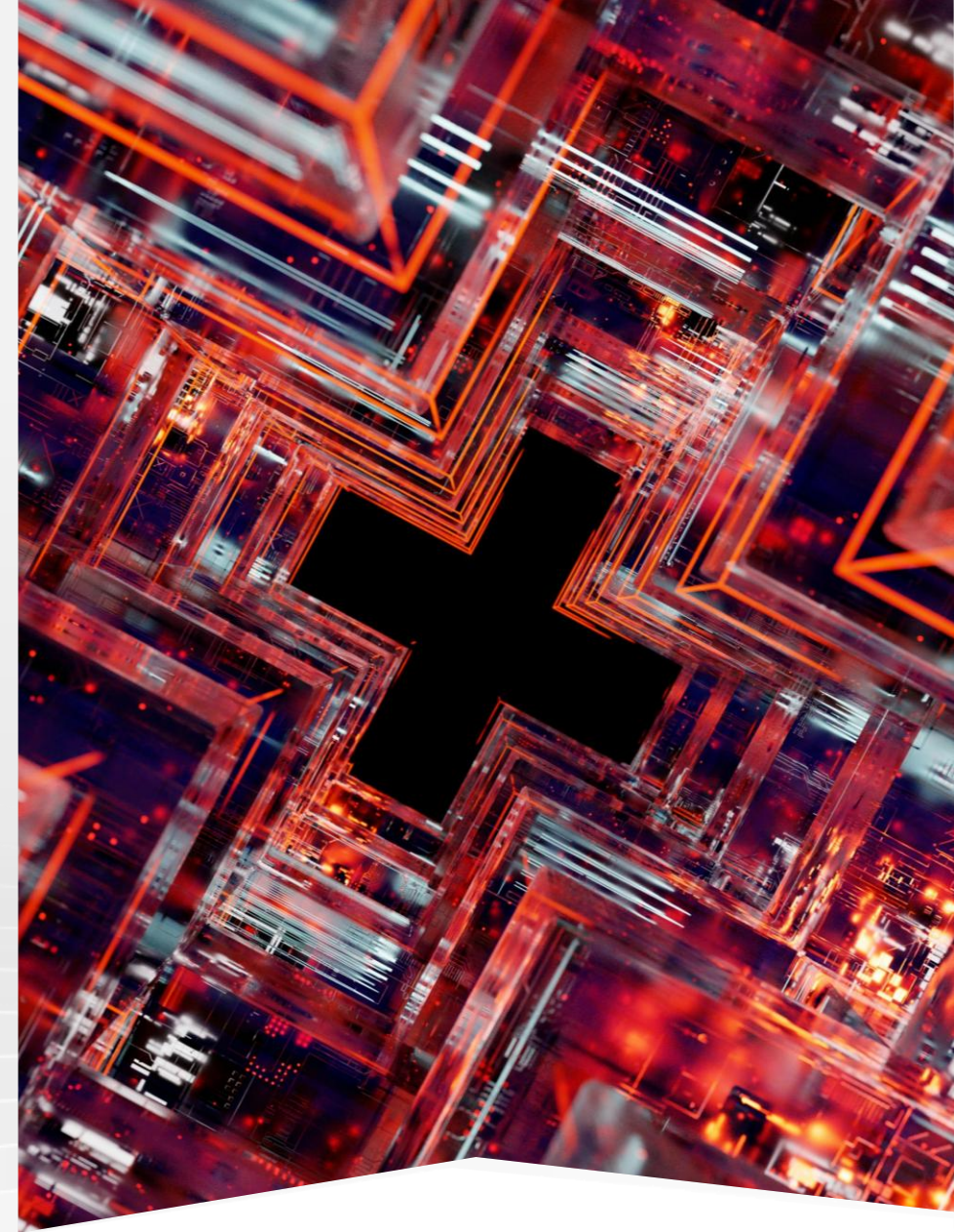
- ✓ Allianz's KM strategy demonstrates that **effective knowledge sharing requires both structured (human-driven) and automated (technology-driven) solutions**.
- ✓ **Decentralization poses unique KM challenges, making role-based customization essential.**
- ✓ **Future KM tools must integrate AI, better taxonomy management, and user-friendly designs to increase adoption.**

Would you like a deeper dive into any specific aspect of the study? 🚀

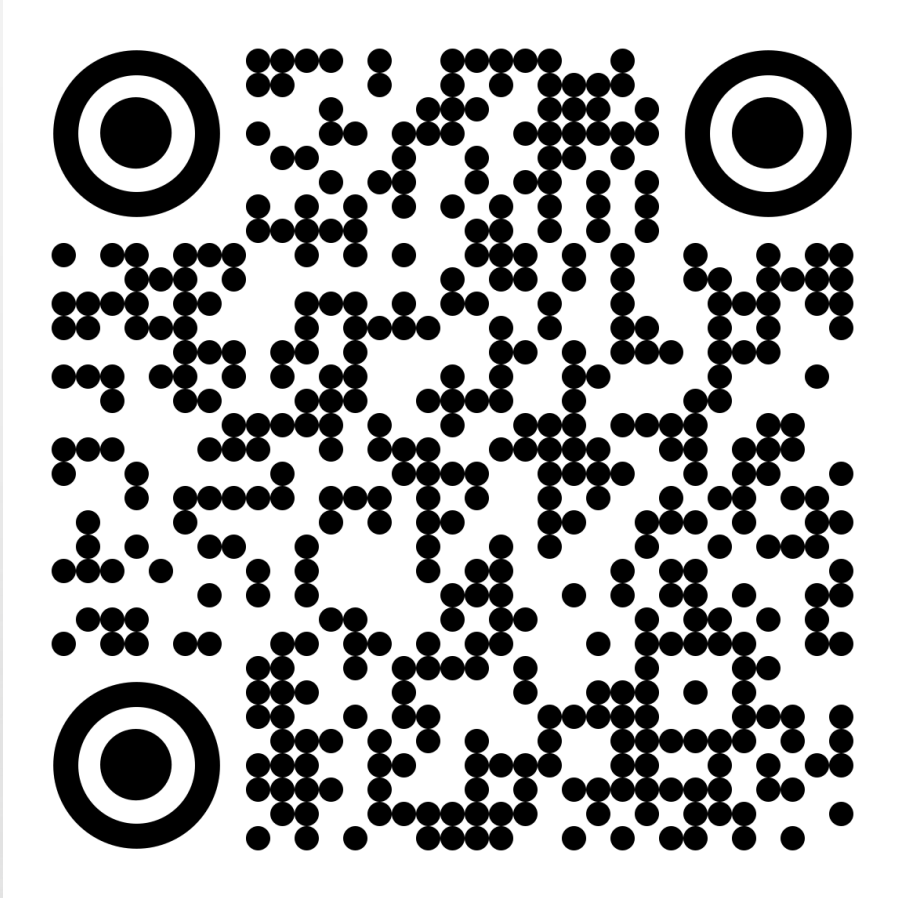


Conclusion and Q&A

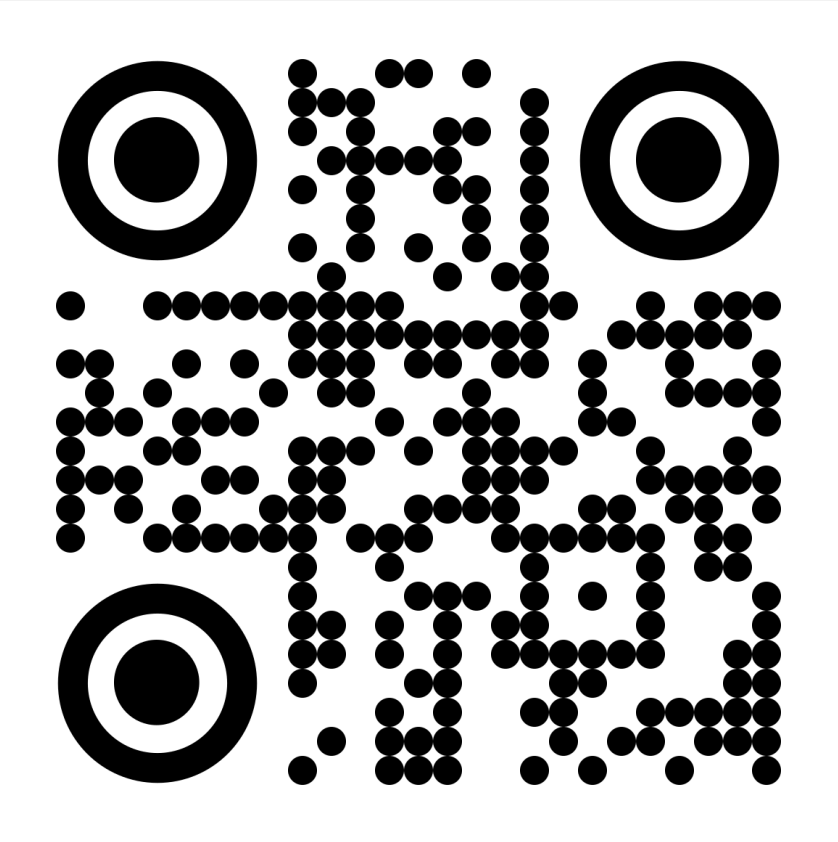
- Is Reasoning in new LLM remove the need of prompt engineering ?
- Prompt engineering is critical for maximizing the potential of AI models.
- The quality of the prompt directly impacts the quality of the AI output.
- Mastering prompts ([is still valid today](#)) can lead to better, faster, and more consistent results in various applications.



Contact info



private blog -> prompt examples to come..



Thank you

