

Prompt Engineering



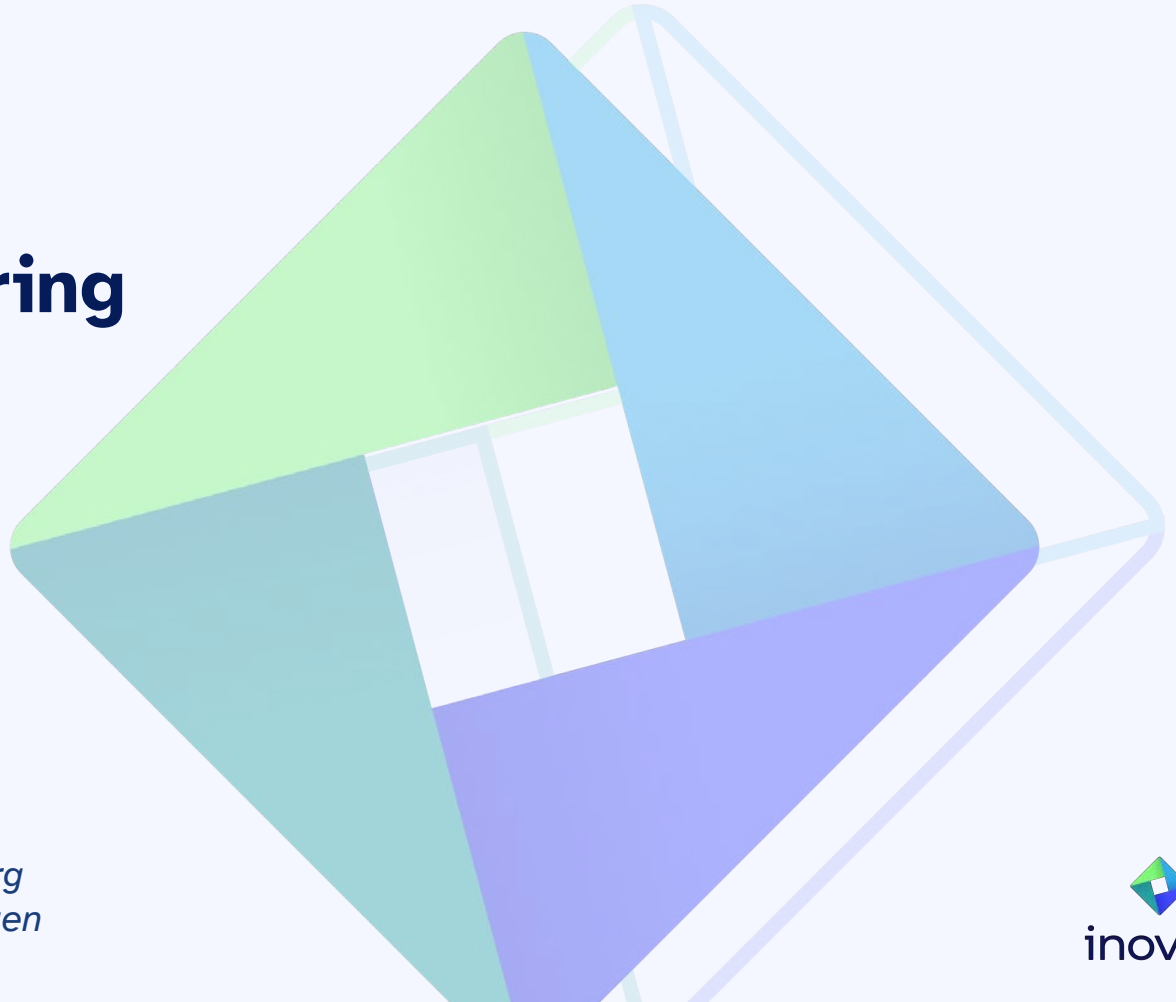
Prompt: A vintage 1980s high school yearbook photo of astonished child with open mouth

Prompt Engineering

From Zero to GenAI Hero

Team inovex

*Karlsruhe · Köln · München · Hamburg
Berlin · Stuttgart · Pforzheim · Erlangen*



inovex

Prompting = Programming with natural language



Prompt: A message you send to a GenAI

Prompt Engineering: The “science” to send the exact right message to get the output you want

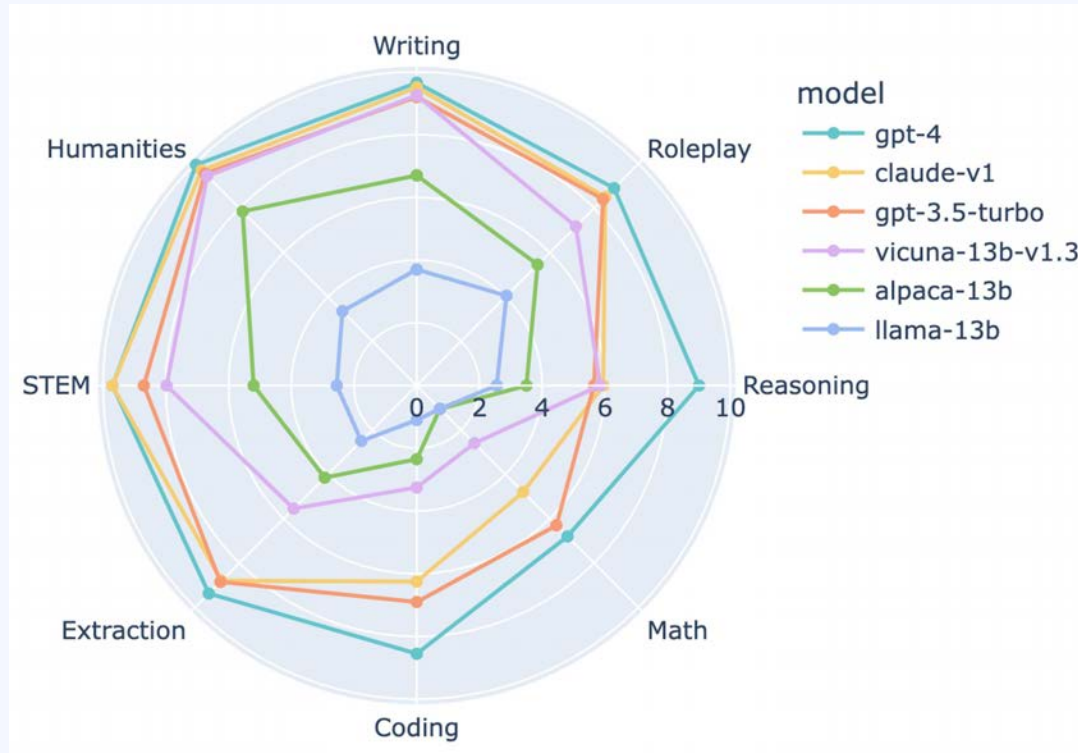
LLMs supercharged with Prompt Engineering

“Let's think step by step”

LLMs supercharged with Prompt Engineering

“... and I will tip you \$200”

LLMs are not good at math



LLMs supercharged with Prompt Engineering

(c) Zero-shot

Q: A juggler can juggle 16 balls. Half of the balls are golf balls, and half of the golf balls are blue. How many blue golf balls are there?

A: The answer (arabic numerals) is

(Output) 8 X

(d) Zero-shot-CoT (Ours)

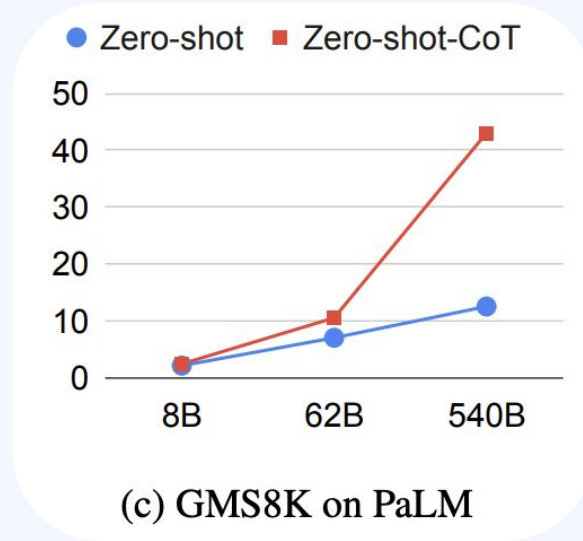
Q: A juggler can juggle 16 balls. Half of the balls are golf balls, and half of the golf balls are blue. How many blue golf balls are there?

A: **Let's think step by step.**

(Output) *There are 16 balls in total. Half of the balls are golf balls. That means that there are 8 golf balls. Half of the golf balls are blue. That means that there are 4 blue golf balls. ✓*

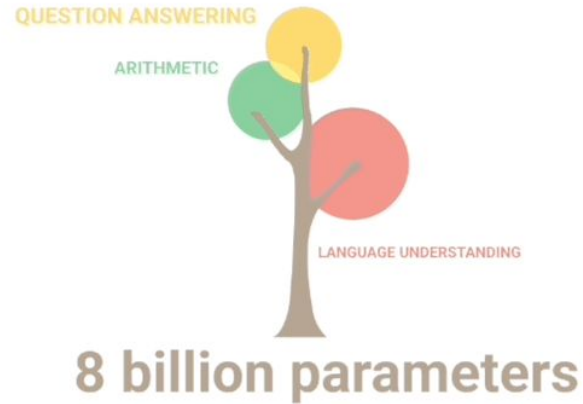
Paper: [Large Language Models are Zero-Shot Reasoners](#)

LLMs supercharged with Prompt Engineering



Paper: [Large Language Models are Zero-Shot Reasoners](#)

LLMs supercharged with Prompt Engineering



Source: <https://blog.research.google/2022/04/pathways-language-model-palm-scaling-to.html>

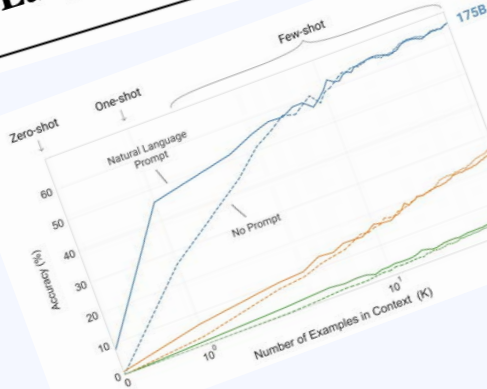
LLMs supercharged with Prompt Engineering

Large Language Models are Zero-Shot Reasoners

Language Models are Few-Shot Learners

Reflexion: Language Agents with Verbal Reinforcement Learning

Chain-of-Thought Prompting Elicits Reasoning in Large Language Models



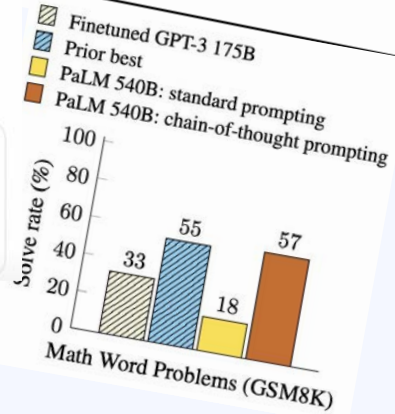
 Andrej Karpathy 
@karpathy

Good example of us not seeing max GPT-4 capability yet, imo. Prompt design, tool use, meta cognition strategies (eg idea of attempt, critique, retry, capabilities model, etc) are very likely to go a long way.

 Eric Jang @ericjang11 · Mar 26

Instead of finding the perfect prompt for an LLM (let's think step by step), you can ask LLMs to critique their outputs and immediately fix their own mistakes. Here's a fun example:

[Show this thread](#)



Interest awakened



Work routine so far

Goal: Creating a watercolor seagull image



Work routine so far

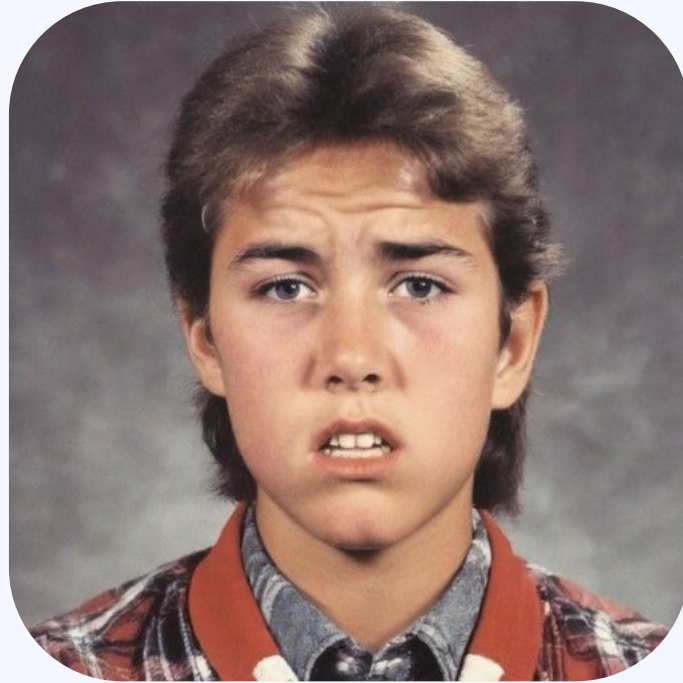
- 1 **Find** a suitable image
- 2 **Understand** GUI
- 3 **Remove** background
- 4 **Add** watercolor effect



Work routine so far



Work routine so far



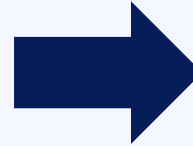
Work routine with GenAI

Prompt: Watercolor artwork of a flying seagull, white background, colorful seagull



*DALL·E 3

Work routine with GenAI



Work routine with GenAI



@sanderhoogeland9161 vor 1 Monat

I have had access to GPT-4 Vision for a few days now, and as a blind person, I must say that I really enjoy using it. Combined with the custom instructions I gave GPT-4, it explains images of scenes, areas, and items around me in a way that I really appreciate and is quite useful so far.



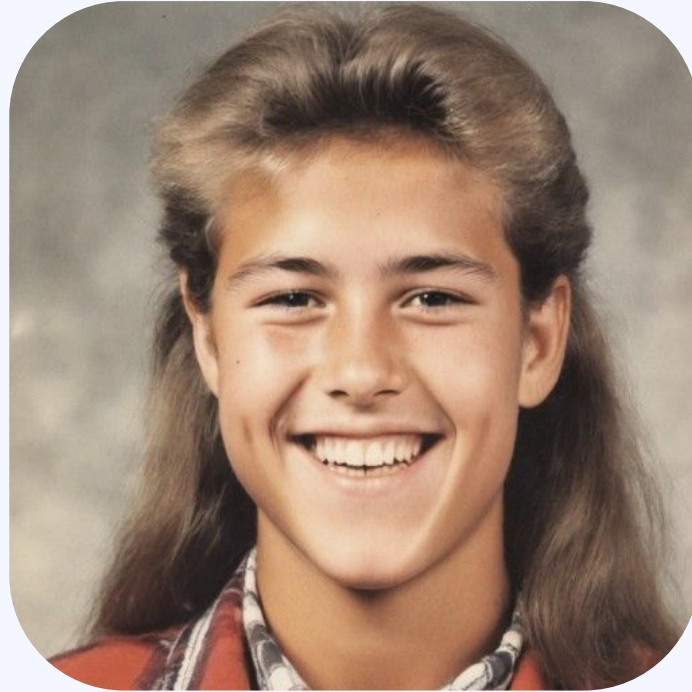
118



Antworten

Accessibility through natural language

Work routine with GenAI

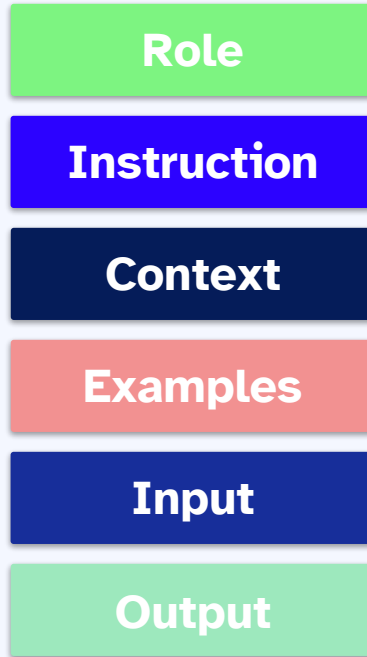


Prompt Engineering as the key to **generative AI**

Let's dive into it



How many elements does a Prompt contain?



Prompt Element: Input/ Question

Input

Was ist Prompt Engineering?

Output

Prompt Engineering ist ein Ansatz zur Entwicklung von Systemen oder Produkten, bei dem der Fokus auf der schnellen und effizienten Umsetzung von Anforderungen liegt. [...]

*GPT-3.5

Prompt Element: Instruction

Input

**Deine Aufgabe ist es die Frage im Bereich ``faktisch korrekt zu beantworten.
``Was ist Prompt Engineering?``**

Techniques: Zero-Shot, Chain of Thought

Output

Prompt Engineering bezieht sich auf die Disziplin, die sich mit der Entwicklung und Implementierung von Systemen und Prozessen zur schnellen und effizienten Erstellung von Texten, Code oder anderen Inhalten befasst. [...]

*GPT-3.5

Prompt Element: Context

Input

Deine Aufgabe ist es die Frage im Bereich ``` faktisch korrekt zu beantworten. Nutze den Kontext im Bereich +++ zur Beantwortung der Frage.

+++Prompt Engineering, also known as In-Context Prompting, refers to methods for how to communicate with LLM to steer its behavior for desired outcomes without updating the model weights. It is an empirical science and the effect of prompt engineering methods can vary a lot among models, thus requiring heavy experimentation and heuristics.+++

```Was ist Prompt Engineering?```

\* Source of context: [Prompt Engineering | Lil'Log \(lilianweng.github.io\)](https://lilianweng.github.io/)

## Output

Prompt Engineering, auch bekannt als In-Context Prompting, bezieht sich auf Methoden, wie man mit LLM kommuniziert, um sein Verhalten für gewünschte Ergebnisse zu lenken, ohne die Modellgewichte zu aktualisieren. [...]

\*GPT-3.5

# Prompt Element: Role

## Input

**Du bist ein Kindergärtner.**

Deine Aufgabe ist es die Frage im Bereich `` faktisch korrekt zu beantworten. Nutze den Kontext im Bereich +++ zur Beantwortung der Frage.

+++Prompt Engineering, also known as In-Context Prompting, refers to methods for how to communicate with LLM to steer its behavior for desired outcomes without updating the model weights. It is an empirical science and the effect of prompt engineering methods can vary a lot among models, thus requiring heavy experimentation and heuristics.+++

``Was ist Prompt Engineering?``

## Output

Als Kindergärtner kann ich es dir so erklären: Prompt Engineering ist wie eine Art Spiel, bei dem wir dem Modell beibringen, wie es sich verhalten soll, ohne seine grundlegenden Fähigkeiten zu ändern. [...]

\*GPT-3.5

# Prompt Element: Examples

## Input

Deine Aufgabe ist es die Eingabe des Nutzers zu klassifizieren.

**Human: Was ist ein Softwareentwickler?**

**AI: Frage**

**Human: Software Entwickler entwickeln Software**

**AI: Aussage**

**Human: Was ist ein Prompt?**

**AI: Frage**

**Human: LinkedIn wird zum Netzwerken verwendet**

**AI: Aussage**

**[...]**

**Human: Was ist Prompt Engineering?**

## Output

**Aussage**

\*GPT-3.5

## Output

**Frage**

\*GPT-4

Techniques: Few-Shot/One-Shot Learning, Chain of Thought

# Technique: One-Shot Chain of Thought

## Standard Prompting

### Model Input

Q: Roger has 5 tennis balls. He buys 2 more cans of tennis balls. Each can has 3 tennis balls. How many tennis balls does he have now?

A: The answer is 11.

Q: The cafeteria had 23 apples. If they used 20 to make lunch and bought 6 more, how many apples do they have?

### Model Output

A: The answer is 27. ❌

## Chain-of-Thought Prompting

### Model Input

Q: Roger has 5 tennis balls. He buys 2 more cans of tennis balls. Each can has 3 tennis balls. How many tennis balls does he have now?

A: Roger started with 5 balls. 2 cans of 3 tennis balls each is 6 tennis balls.  $5 + 6 = 11$ . The answer is 11.

Q: The cafeteria had 23 apples. If they used 20 to make lunch and bought 6 more, how many apples do they have?

### Model Output

A: The cafeteria had 23 apples originally. They used 20 to make lunch. So they had  $23 - 20 = 3$ . They bought 6 more apples, so they have  $3 + 6 = 9$ . The answer is 9. ✅

# Prompt Element: Output

## Input

Du bist ein Kindergärtner.

Deine Aufgabe ist es die Frage im Bereich ```` zu beantworten. Nutze den Kontext im Bereich

+++ zur Beantwortung der Frage.

+++Prompt Engineering, also known as In-Context Prompting, refers to methods for how to communicate with LLM to steer its behavior for desired outcomes without updating the model weights. It is an empirical science and the effect of prompt engineering methods can vary a lot among models, thus requiring heavy experimentation and heuristics.+++

Human: Was ist ein Softwareentwickler?

AI: Frage

Human: Software Entwickler entwickeln Software

AI: Aussage

Human: Was ist ein Prompt?

AI: Frage

Human: LinkedIn wir zum Netzwerken verwendet

AI: Aussage

[...]

````Was ist Prompt Engineering?````

Formatiere das Ergebnis in JSON z.B.

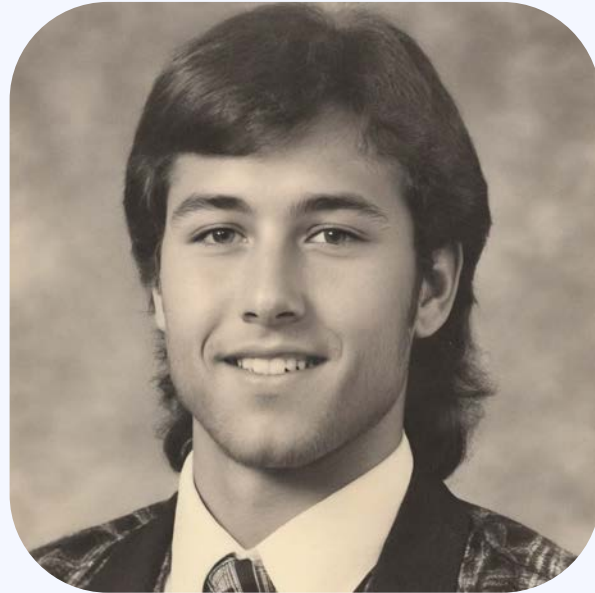
```
{  
  "answer": "",  
  "classification": ""  
}
```

Output

```
{  
  "answer": "Prompt Engineering, auch bekannt als [...]",  
  "classification": "Frage"  
}
```

*GPT-4

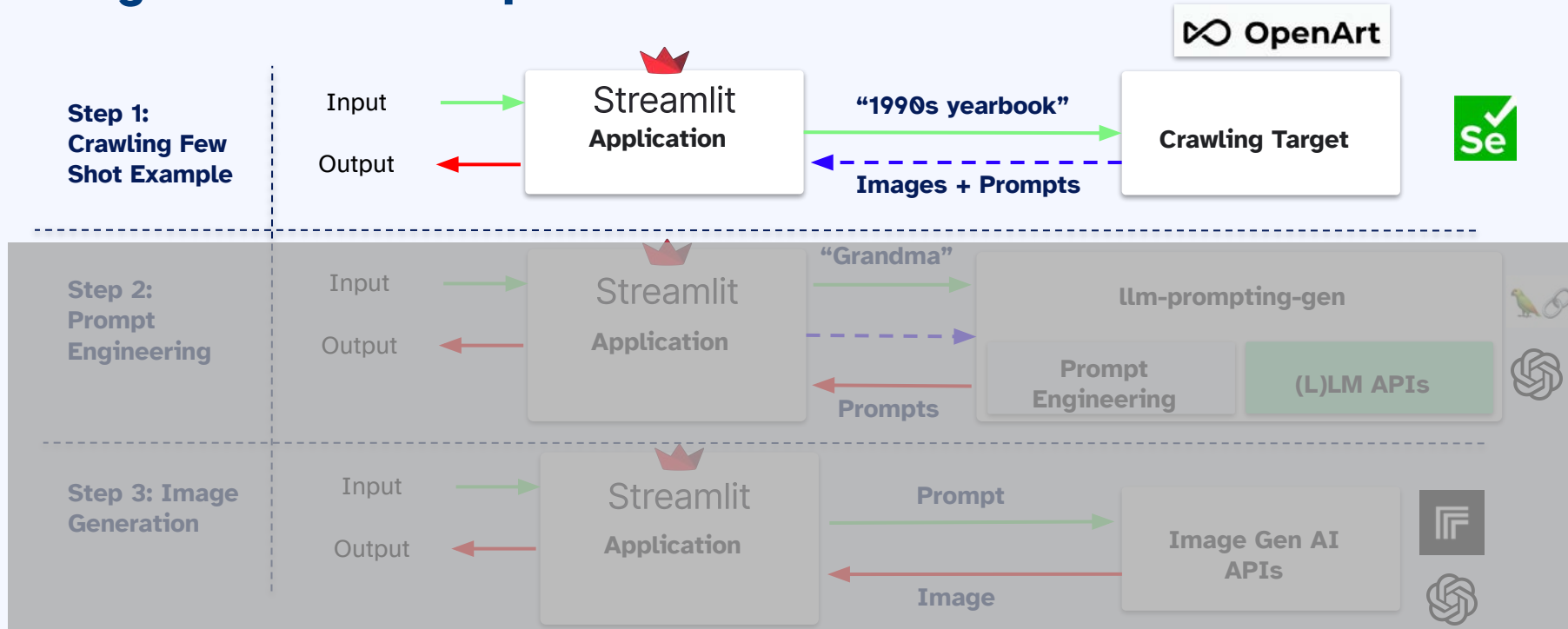
Finally full-grown



How to apply our acquired knowledge to a specific use case?

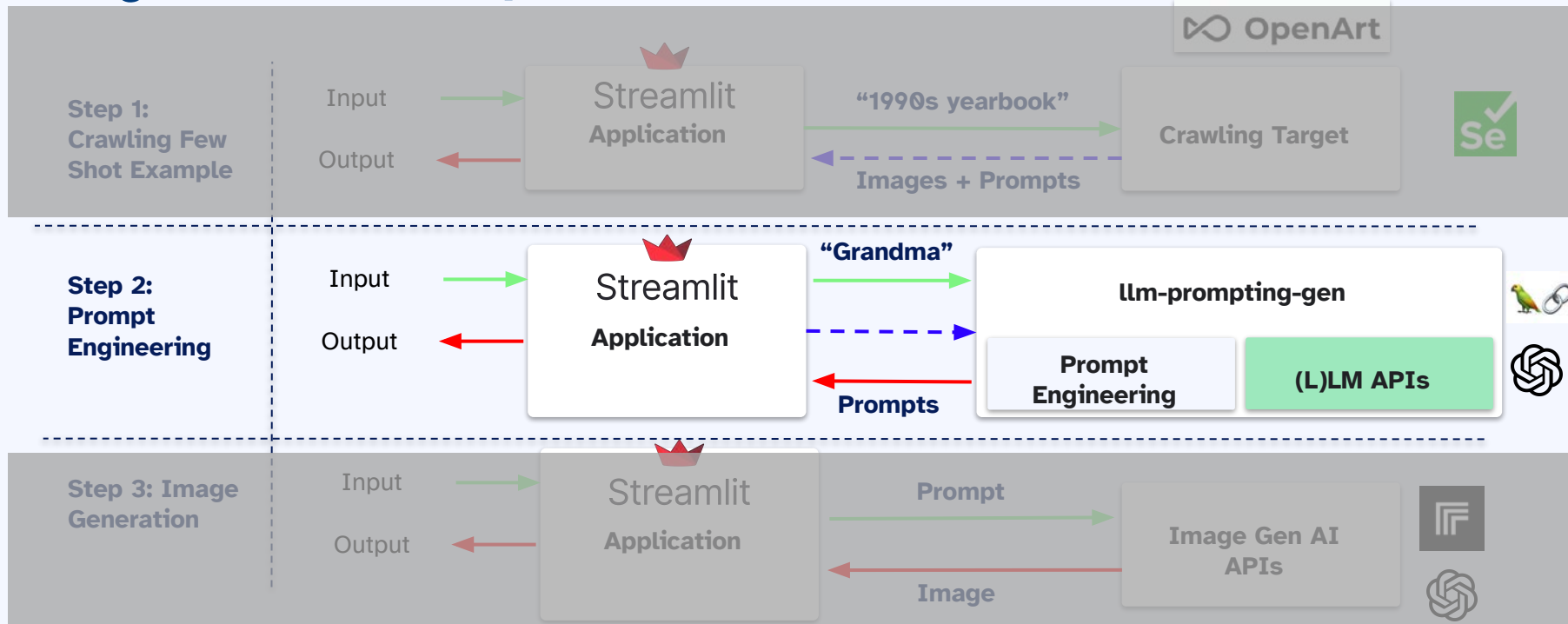
**Idea: Using prompt engineering techniques
to create text-to-image prompts**

Image Gen AI Prompt Generator



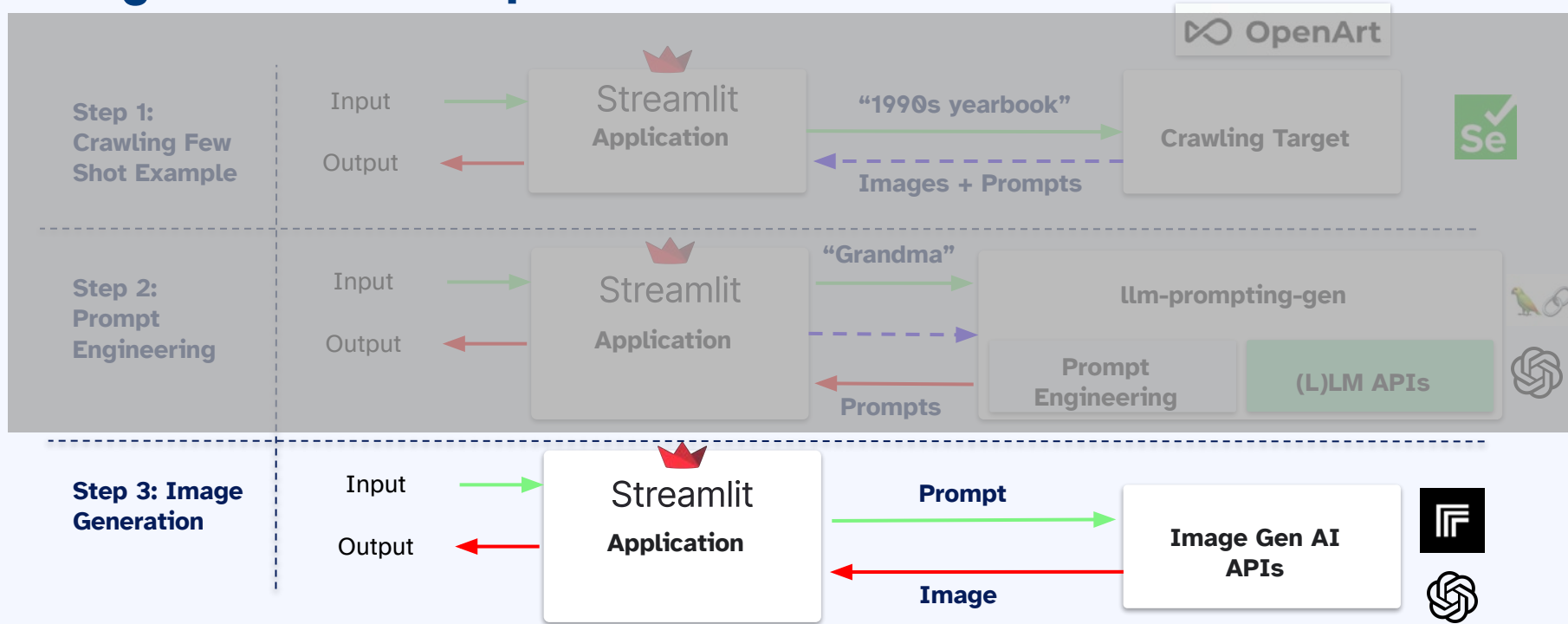
- Flow of crawling data
- Flow of user input
- Outputs returned to users

Image Gen AI Prompt Generator



- Flow of crawling data
- Flow of user input
- Outputs returned to users

Image Gen AI Prompt Generator



- - -> Flow of crawling data
- Flow of user input
- Outputs returned to users

Image Gen AI Prompt Generator



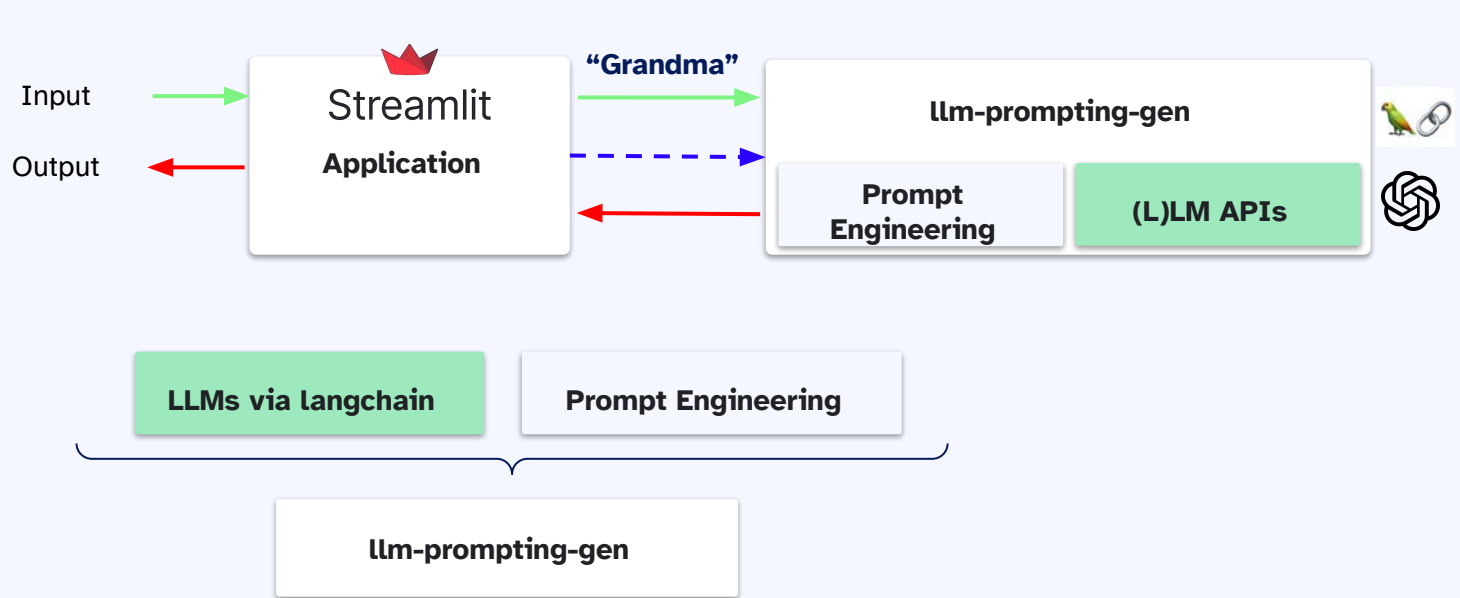
*SDXL



*Midjourney

LLM Prompt Engineering Generator

Step 2:
Prompt
Engineering



Github: <https://github.com/FloTeu/llm-prompt-engineering-generator>

Simple example

LLMs via langchain

Prompt Engineering

llm-prompting-gen

Template JSON stored in: "templates/kindergartner.json"

```
{  
  "role": "You are a kindergartner.",  
  "instruction": "Answer as you would speak to your kindergarten children.",  
  "input": "{text}"  
}
```

```
from llm_prompting_gen.generators import PromptEngineeringGenerator  
from langchain.chat_models import ChatOpenAI  
  
# Simply load a JSON file following the format of llm_prompting_gen.models.prompt_engineering.PromptElement  
# Make sure env variable OPENAI_API_KEY is set  
llm = ChatOpenAI(temperature=0.0)  
keyword_extractor = PromptEngineeringGenerator.from_json("templates/kindergartner.json", llm=llm)  
llm_output = keyword_extractor.generate(text="Explain Prompt Engineering")
```

Github: <https://github.com/FloTeu/llm-prompt-engineering-generator>

LIVE DEMO



<https://image-gen-ai-app.streamlit.app/>

Key takeaways

1. 6 prompt elements is all you need
2. Write clear, clean, and detailed instructions
3. Give the model time to think

Sources

Prompt Engineering Websites

learnprompting.org

<https://www.promptingguide.ai/>

[Lil'Log](#)

Papers

CoT: <https://arxiv.org/pdf/2201.11903.pdf>

Few Shot Learners: <https://arxiv.org/pdf/2005.14165.pdf>

Reflexion: <https://arxiv.org/pdf/2303.11366.pdf>

Zero Shot Reasoners: <https://arxiv.org/pdf/2205.11916.pdf>

Thanks!



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Machine Learning Engineer



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