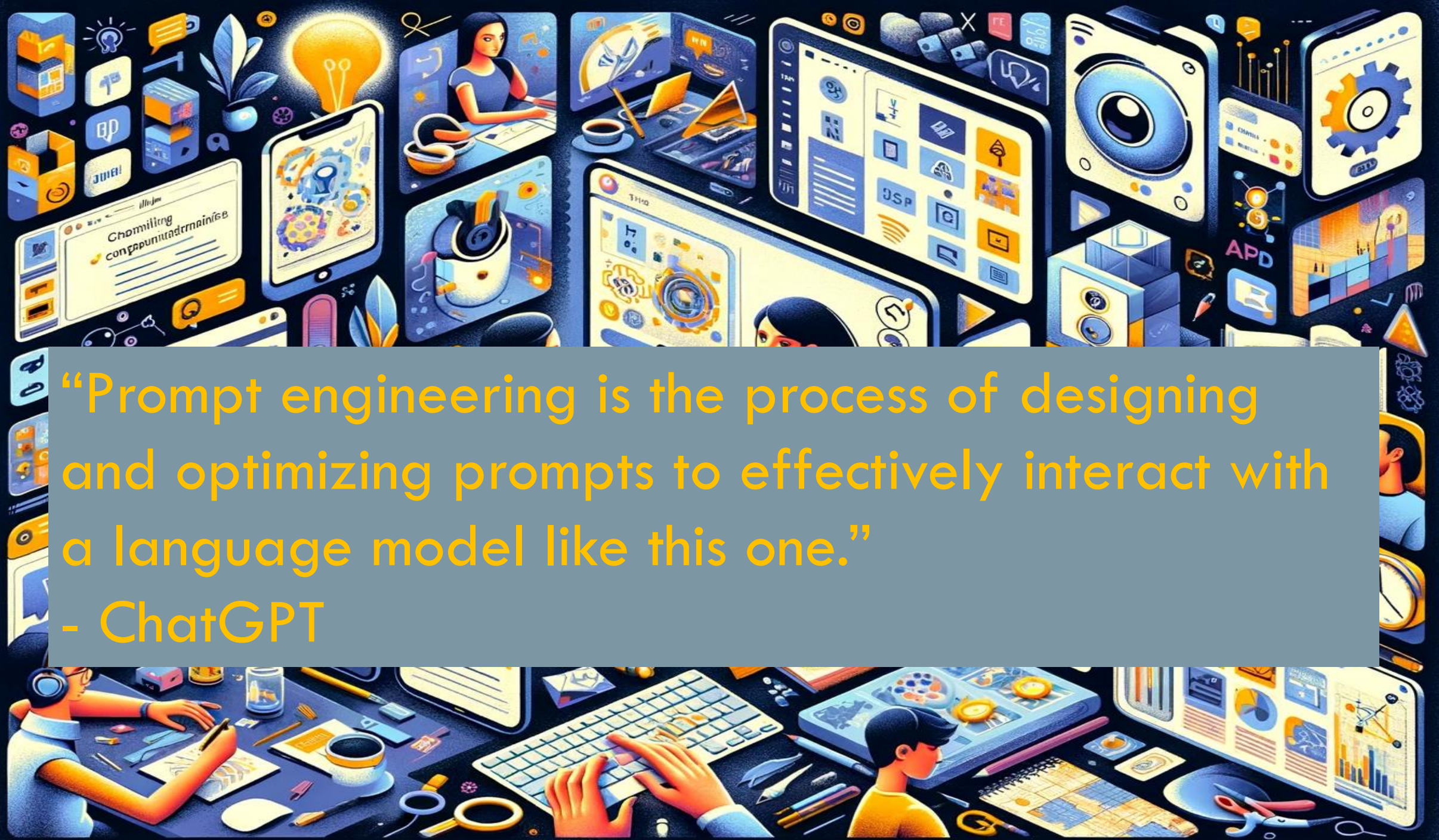


PROMPT ENGINEERING WITH CHATGPT

PART 2




ReallyEasy.AI





“Prompt engineering is the process of designing and optimizing prompts to effectively interact with a language model like this one.”


- ChatGPT


CUSTOM INSTRUCTIONS


 My plan

 My GPTs

 Custom instructions

 Settings & Beta

 Log out

 ReallyEasyAI Consulting

Custom instructions ⓘ

What would you like ChatGPT to know about you to provide better responses?

0/1500

How would you like ChatGPT to respond?

10. Cite credible sources to support answers; guide users on how to locate these sources.
11. Recognize and correct mistakes in previous responses.
12. Ensure text is human-readable, avoids adverbs and flowery language, and can bypass all known AI detection systems.
13. Optimize code to be fast and efficient.
14. Include human-like comments in code, adhering to the style of rule 12.
15. When in doubt, ask how the user would like output presented.

1257/1500

Hide tips ⓘ

Enable for new chats ☒

Cancel

Save

Thought starters

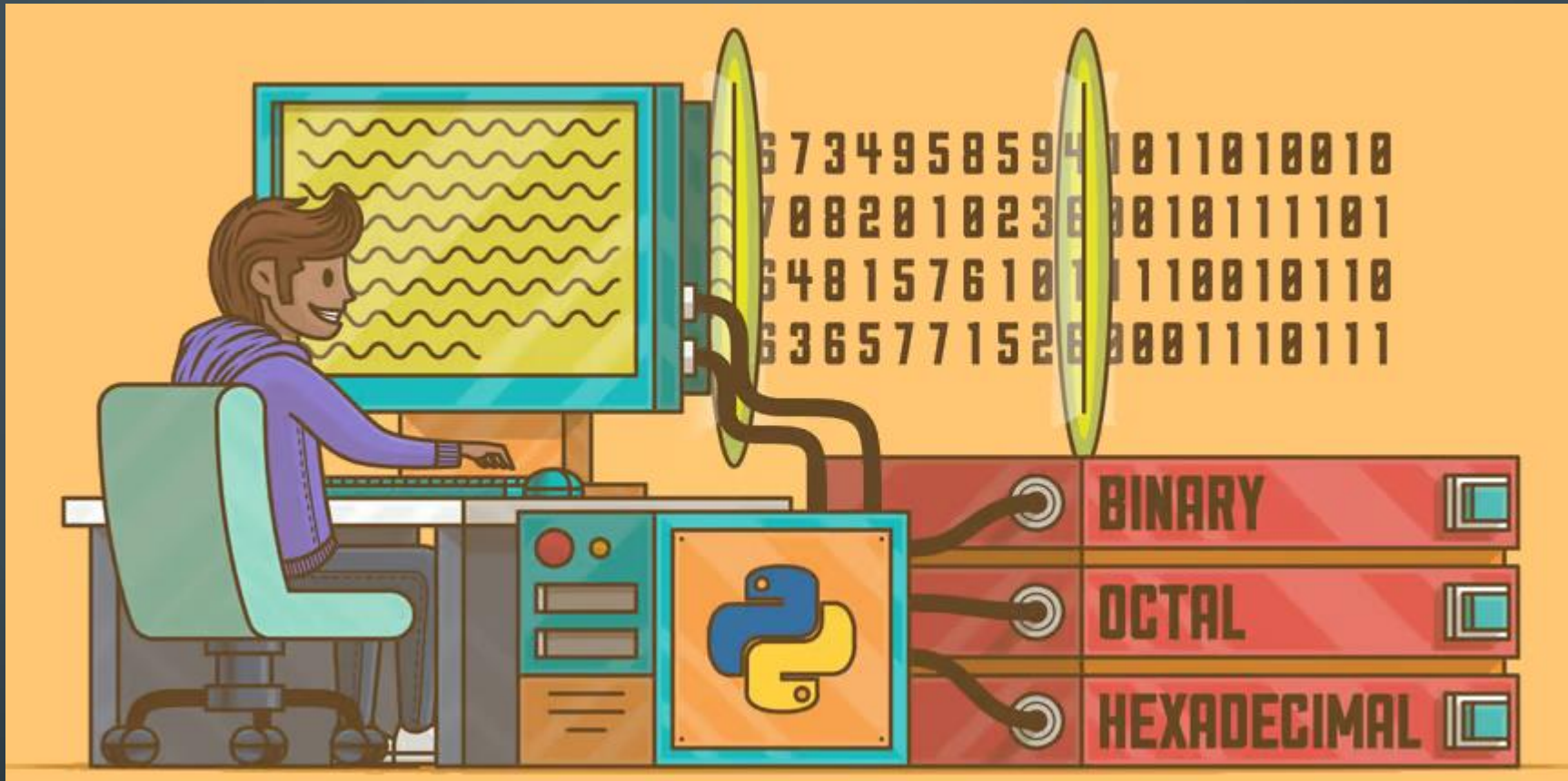
- How formal or casual should ChatGPT be?
- How long or short should responses generally be?
- How do you want to be addressed?
- Should ChatGPT have opinions on topics or remain neutral?

START CLEAN WHEN EXPERIMENTING

When experimenting with different prompting techniques, **always** make sure you clear out custom instructions (make sure to save them somewhere) and start with a fresh chat session. Also, be aware of **system instructions** that you can't see that can influence your tests.

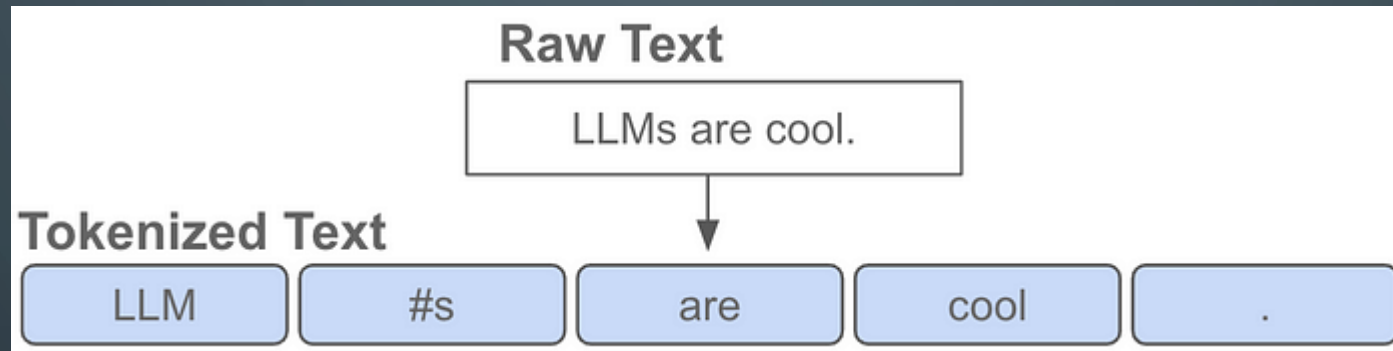
TOKENIZATION AND PREDICTION





| Characters | C | h | a | t | G | P | T |
|---------------|----------|----------|----------|----------|----------|----------|----------|
| ASCII Values | 67 | 104 | 97 | 116 | 71 | 80 | 84 |
| Binary Values | 01000011 | 01101000 | 01100001 | 01110100 | 01000111 | 01010000 | 01010100 |

TOKENS & TOKENIZERS



OPENAI TOKENIZER

GPT-3.5 & GPT-4

GPT-3 (Legacy)

This is a tokenizer.

Clear

Show example

Tokens

5

Characters

20

This is a tokenizer.

TEXT

TOKEN IDS

GPT-3.5 & GPT-4

GPT-3 (Legacy)

This is a tokenizer.

Clear

Show example

Tokens

5

Characters

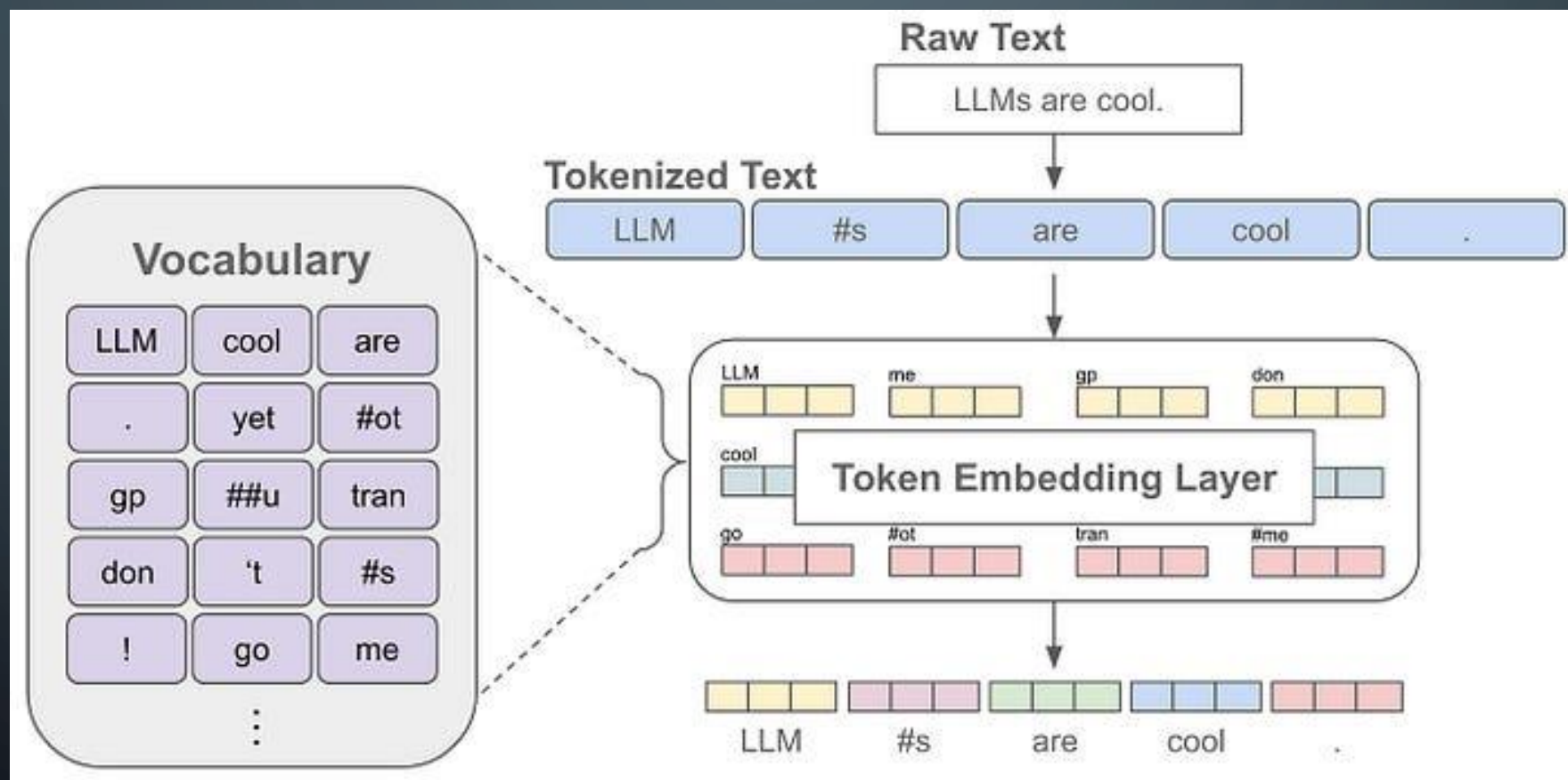
20

[2028, 374, 264, 47058, 13]

TEXT

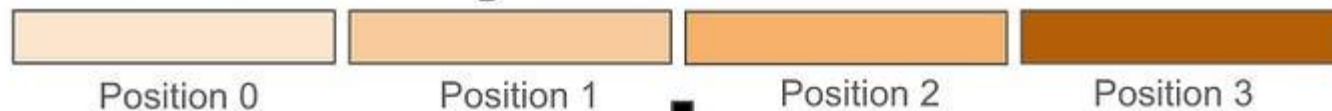
TOKEN IDS

VOCABULARY

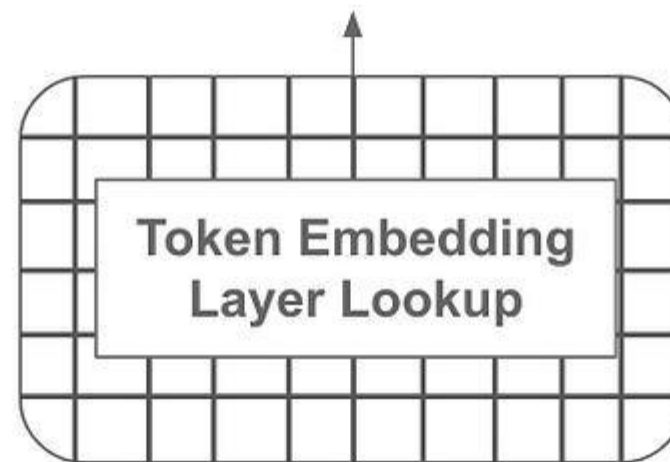
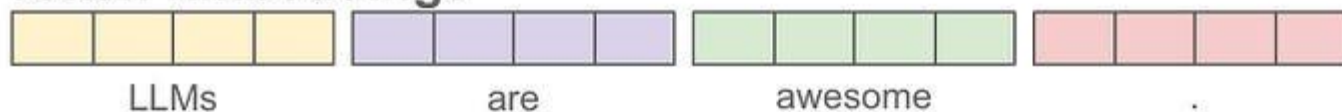


POSITIONING

Position Embeddings



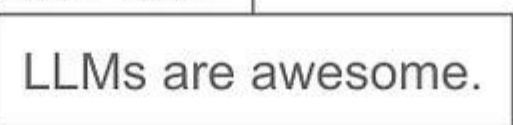
Token Embeddings



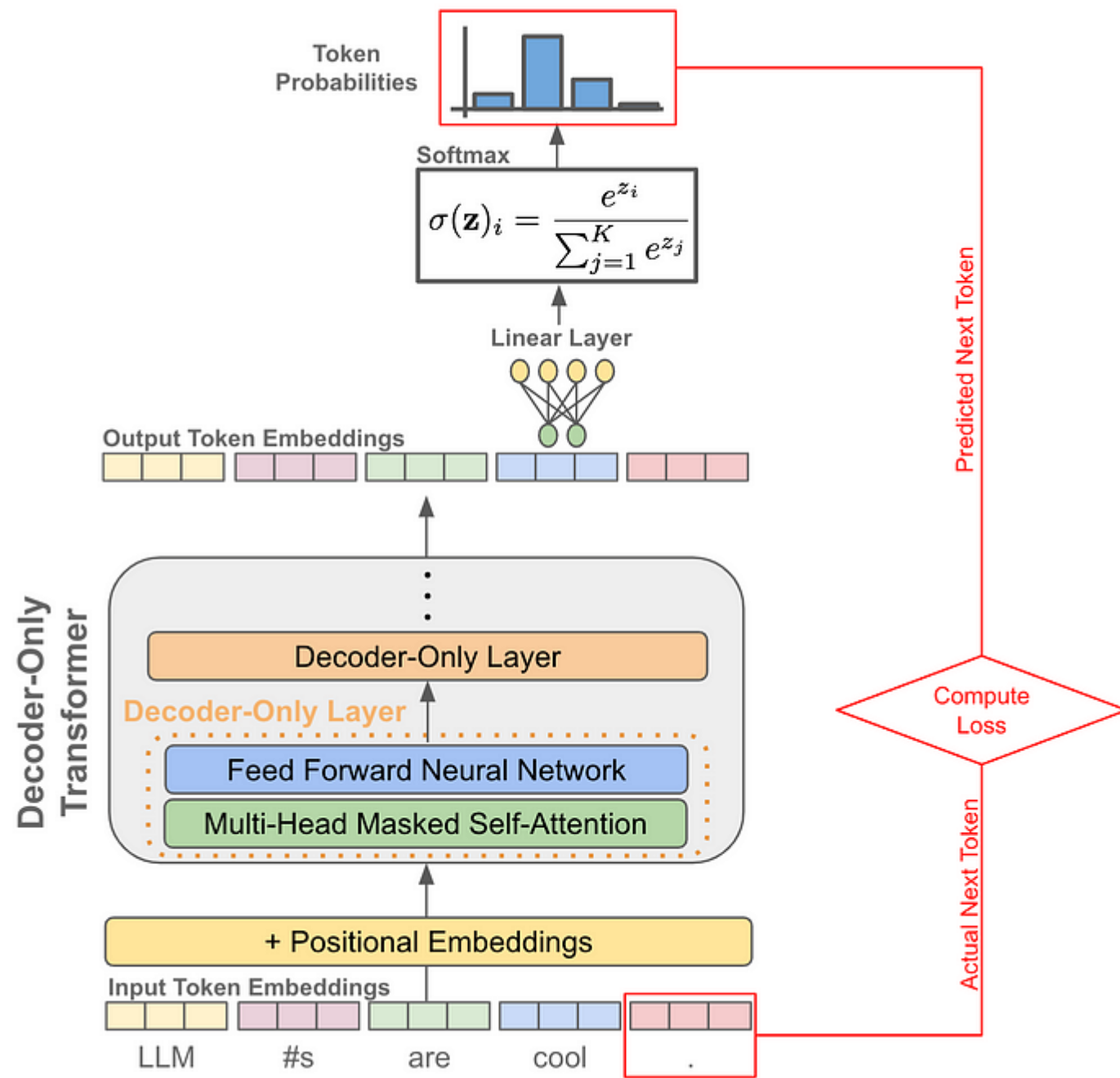
Tokenized Text



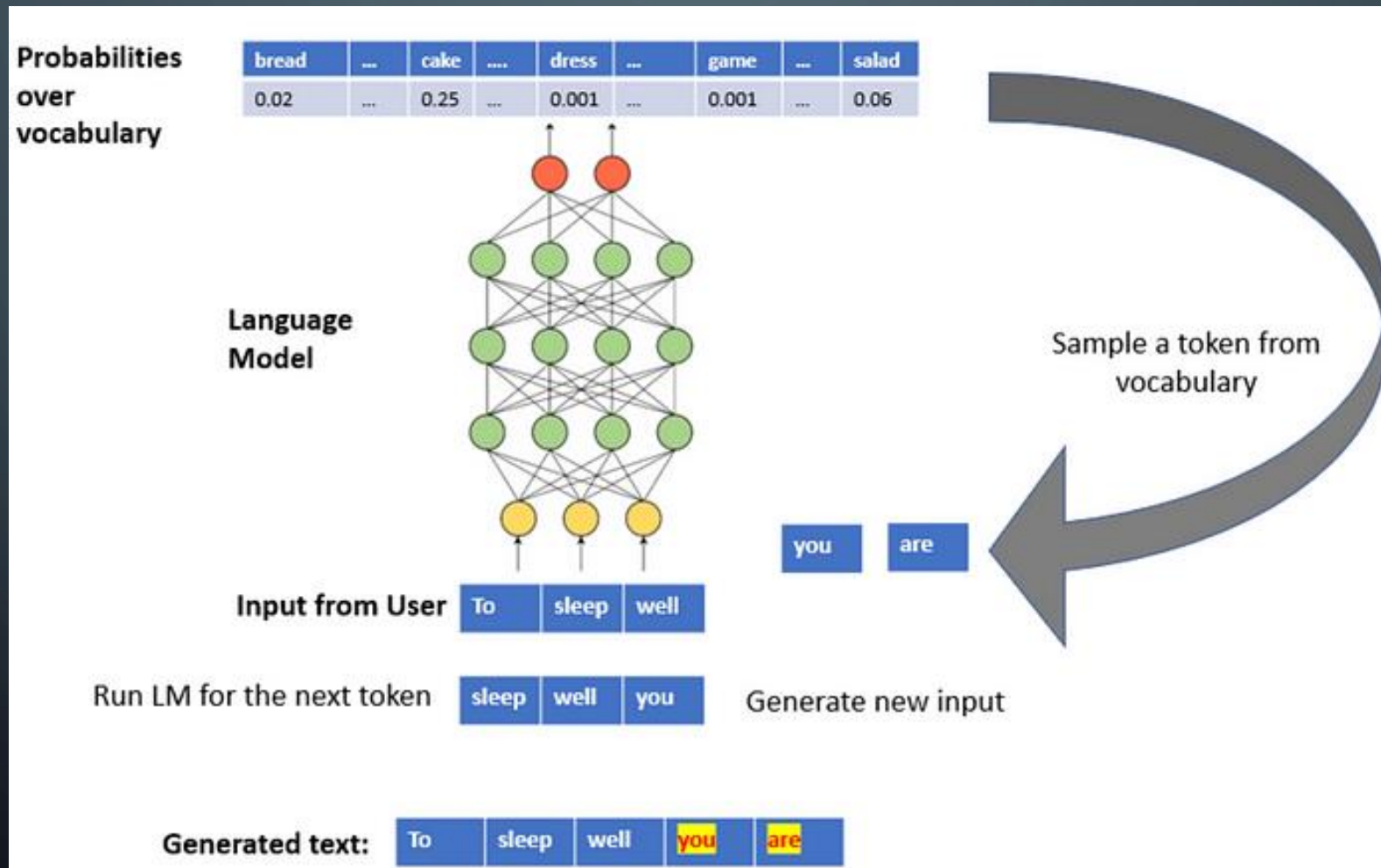
Raw Text



PREDICTION



PREDICTION SIMPLIFIED



PREDICTION IN ACTION



You

im going to give you a series of phrases that I need you to complete. only show me the completion of the phrase and nothing else. do you understand?



ChatGPT

Understood.



You

To sleep well



ChatGPT

"...at night, practice good sleep hygiene."



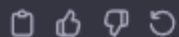
You

To sleep well, you



ChatGPT

"...should create a relaxing bedtime routine."



You

LLMs are cool.



ChatGPT

"...because they can process and generate vast amounts of information quickly."



You

LLMs are cool.



ChatGPT

"...for their ability to understand and respond to a wide range of queries."



WHAT DOES THIS HAVE TO DO WITH PROMPT DESIGN?

FEW RELEVANT TOKENS

GPT-3.5 & GPT-4 GPT-3 (Legacy)

Write about space exploration.

Clear

Show example

Tokens

5

Characters

30

Write about space exploration.

MANY RELEVANT TOKENS

GPT-3.5 & GPT-4

GPT-3 (Legacy)

Describe the technological advancements achieved by the Mars Rover missions and their significance in the search for extraterrestrial life.

Clear

Show example

Tokens

22

Characters

139

Describe the technological advancements achieved by the Mars Rover missions and their significance in the search for extraterrestrial life.

SPELLING MATTERS

GPT-3.5 & GPT-4 GPT-3 (Legacy)

This is a prediction phrase.

Clear

Show example

Tokens

6

Characters

28

[2028, 374, 264, 20212, 17571, 13]

GPT-3.5 & GPT-4 GPT-3 (Legacy)

This is a predction phase.

Clear

Show example

Tokens

7

Characters

26

[2028, 374, 264, 4255, 407, 10474, 13]



TEMPERATURE

WHY ISN'T THE ANSWER THE SAME EVERY TIME?

| Use Case | Temperature | Top_p | Description |
|--------------------------|-------------|-------|--|
| Code Generation | 0.2 | 0.1 | Generates code that adheres to established patterns and conventions. Output is more deterministic and focused. Useful for generating syntactically correct code. |
| Creative Writing | 0.7 | 0.8 | Generates creative and diverse text for storytelling. Output is more exploratory and less constrained by patterns. |
| Chatbot Responses | 0.5 | 0.5 | Generates conversational responses that balance coherence and diversity. Output is more natural and engaging. |
| Code Comment Generation | 0.3 | 0.2 | Generates code comments that are more likely to be concise and relevant. Output is more deterministic and adheres to conventions. |
| Data Analysis Scripting | 0.2 | 0.1 | Generates data analysis scripts that are more likely to be correct and efficient. Output is more deterministic and focused. |
| Exploratory Code Writing | 0.6 | 0.7 | Generates code that explores alternative solutions and creative approaches. Output is less constrained by established patterns. |

Model

gpt-4-1106-preview

Temperature

1

Maximum length

256

Stop sequences

Enter sequence and press Tab

Top P

1

Frequency penalty

0

Presence penalty

0

TEMPERATURE



You

Give me 3 names for my cat with 3 legs, temperature 0.1.



ChatGPT

Certainly! Naming a three-legged cat can be quite unique and endearing. Here are three name suggestions:

1. **Tripod** - This name playfully acknowledges your cat's three-legged stance with a touch of humor and affection.
2. **Trio** - A simple yet elegant name that subtly hints at the number 'three'.
3. **Pirate** - An adventurous and spirited name, often associated with peg-legged pirates, giving it a quirky twist for a three-legged cat.

These names are chosen to be memorable and fitting for your cat's unique character.



You

Give me 3 names for my cat with 3 legs, temperature 0.7.



ChatGPT

Of course! With a higher temperature setting, the names can be more creative and less directly related to your cat's three-legged nature. Here are three imaginative name suggestions:

1. **Galileo** - Named after the famous astronomer, this name has a sense of exploration and curiosity, perfect for a cat with a unique perspective on the world.
2. **Zephyr** - This name means a gentle breeze, suggesting grace and lightness, a beautiful choice for a cat who moves in their own special way.
3. **Marbles** - A playful and whimsical name, evoking images of fun and games, fitting for a spirited and resilient three-legged cat.

These names are designed to be charming and distinctive, reflecting your cat's individuality and spirited nature.



You

Give me 3 names for my cat with 3 legs, temperature 1.5.



ChatGPT

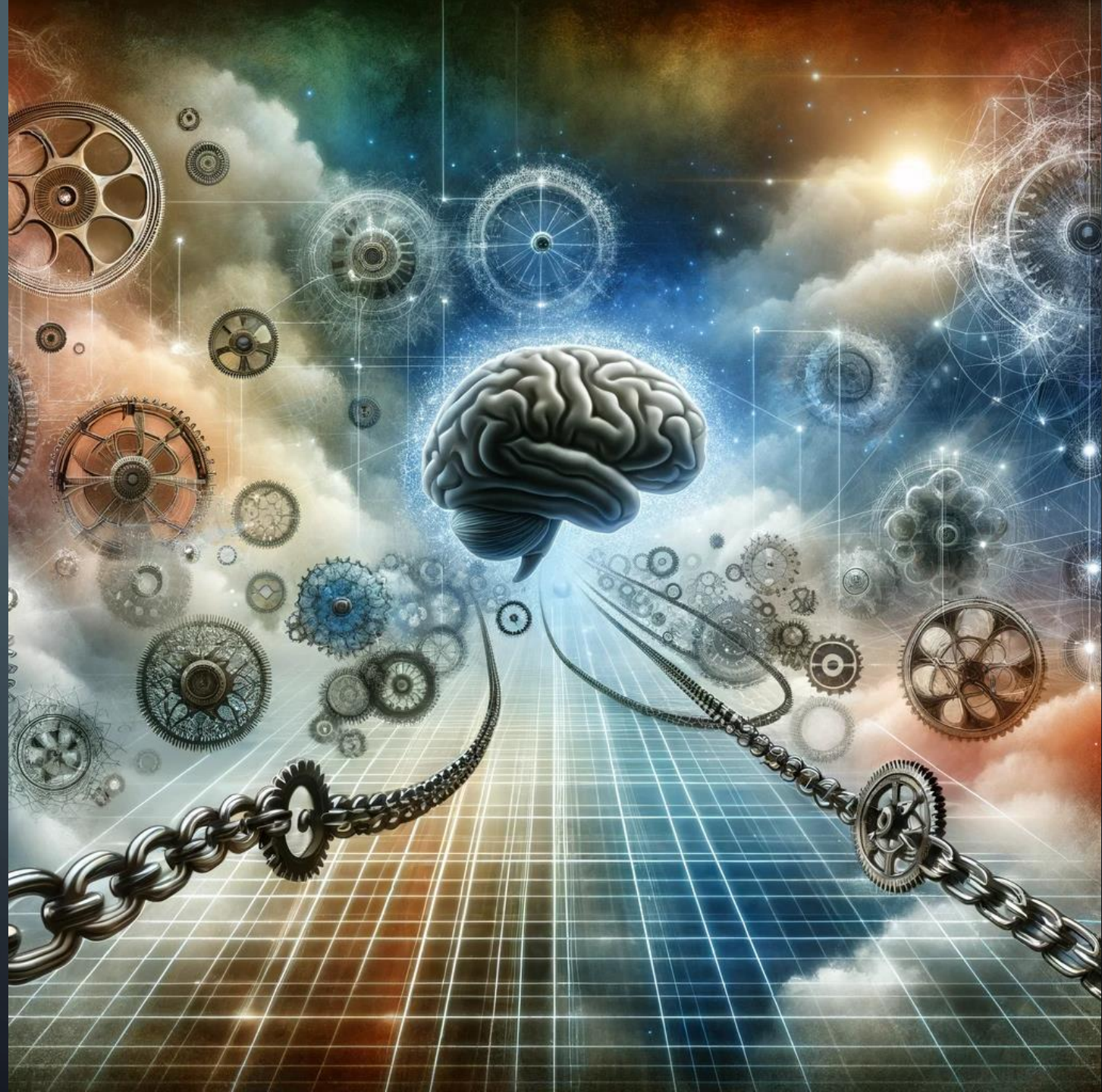
Certainly! With a temperature setting of 1.5, the names can be quite whimsical and abstract. Here are three creative and unconventional name suggestions for your three-legged cat:

1. **Starwhisker** - A fantastical and dreamy name, evoking images of celestial wonders and a whimsical charm.
2. **Blinkenboots** - This playful and quirky name combines the allure of mystery with a touch of whimsy, perfect for a cat with a unique and adventurous spirit.
3. **Moonjumper** - An imaginative name that paints a picture of boundless energy and the ability to overcome challenges, all while maintaining a sense of playfulness and joy.

These names are selected to be unique and memorable, capturing the magical and extraordinary nature of your special cat.



PROMPTING



GENERATED KNOWLEDGE

Generated Knowledge Prompting is designed to enhance the performance of commonsense reasoning. It involves two steps: first, generating relevant knowledge statements, and second, using these statements to inform and enhance the model's response to a particular question or task.

Pros:

Improves large-scale model performance on commonsense reasoning tasks without task-specific supervision or structured knowledge bases.

Flexible method, applicable across different tasks and datasets.

Cons:

Relies on the quality and quantity of generated knowledge, which may vary.

Limited to the knowledge that can be generated by the language model itself.

Use-Cases:

Enhancing AI models' ability to perform commonsense reasoning in various contexts.

Applicable in scenarios where structured knowledge bases are unavailable or insufficient.

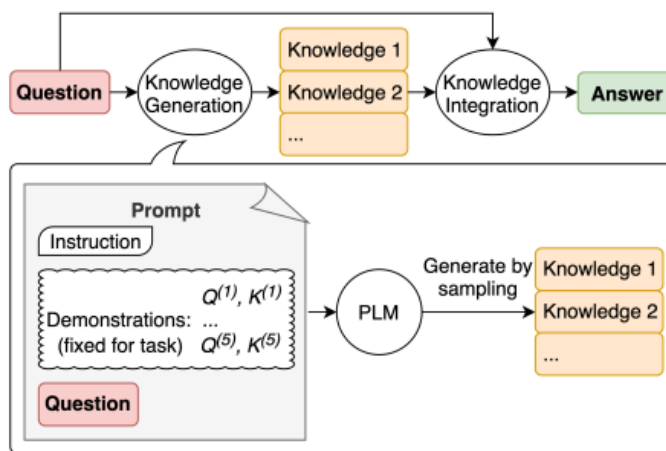
GENERATED KNOWLEDGE ORIGIN

Generated Knowledge Prompting for Commonsense Reasoning

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Peter West^{♡♣} Ronan Le Bras[♣] Yejin Choi^{♡♣} Hannaneh Hajishirzi^{♡♣}
[♡]Paul G. Allen School of Computer Science & Engineering, University of Washington
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Abstract

It remains an open question whether incorporating external knowledge benefits commonsense reasoning while maintaining the flexibility of pretrained sequence models. To investigate this question, we develop generated knowledge prompting, which consists of generating knowledge from a language model, then providing the knowledge as additional input when answering a question. Our method does not require task-specific supervision for knowledge integration, or access to a struc-



GENERATED KNOWLEDGE



You

Generate key facts about black holes.



ChatGPT

Black holes are fascinating and complex astronomical objects. Here are some key facts about them:

1. **Definition:** A black hole is a region of space where the gravitational pull is so strong that nothing, not even light, can escape it. This makes them invisible and detectable only through their interactions with surrounding matter.
2. **Formation:** Black holes are formed from the remnants of massive stars that have ended their life cycles. When such a star depletes its nuclear fuel, it undergoes a supernova explosion, and if the remaining mass is sufficient, it collapses into a black hole.



You

Why are black holes considered important in understanding the universe?



ChatGPT

Black holes are considered extremely important in understanding the universe for several reasons, largely related to their unique properties and the extreme conditions they represent. Here are some key aspects that highlight their significance:

1. **Testing Ground for General Relativity:** Black holes offer a crucial testing ground for Albert Einstein's theory of general relativity, which describes how gravity works on a cosmic scale. The extreme gravitational fields near black holes push this theory to its limits, allowing astronomers and physicists to test its predictions in conditions not found elsewhere in the universe.
2. **Studying Extreme States of Matter:** At their cores, black holes host singularities, points where densities and gravitational forces are thought to become infinite. Studying the physics near these singularities can provide insights into the behavior of matter under the most extreme conditions.

ZERO-SHOT

Zero-shot prompting refers to the practice of giving a prompt to the model that it hasn't been explicitly trained on, yet the model can still produce the desired output.

Pros:

Can be used to generate a wide variety of outputs without needing explicit training data.

Can be used to generate creative and novel outputs.

Cons:

May not always produce the desired output.

May require fine-tuning or experimentation to find effective prompts.

Use-cases:

Generating creative content such as poems, stories, or artwork.

Performing tasks that the model has not been explicitly trained on, such as translation or summarization.

ZERO-SHOT



You

Write me a one-paragraph Christmas story that is funny in the style of a pirate



ChatGPT

Ahoy there! On one jolly Christmas Eve, Captain Redbeard, the most feared pirate of the Seven Seas, decided to embrace the holiday spirit. Decked out in a Santa hat atop his fearsome hat, he led his crew in a quest to steal the greatest treasure of all - Christmas cheer! They set sail to the North Pole, where they mistook a gathering of penguins for an enemy crew and engaged in a wild snowball fight, only to realize their mistake when the penguins waddled off, unbothered. The pirates, undeterred, continued their quest, singing sea shanties twisted with Christmas tunes. They finally stumbled upon Santa's workshop, but instead of looting, they were so taken by the elves' festive spirit that they ended up helping wrap presents. Captain Redbeard, with a twinkle in his eye, declared, "Arr, this be the best plunder of all!" and they sailed away, leaving behind a trail of tinsel and a story that the elves would chuckle over for many Christmases to come.



FEW-SHOT (N-SHOT)

Few-shot prompting refers to presenting a model with a task or question along with a few examples of the desired output.

Pros:

- Can be used to train the model to perform specific tasks with minimal training data.

- Can be used to generate more accurate and consistent outputs.

Cons:

- May require fine-tuning or experimentation to find effective prompts and examples.

- May not be as flexible as zero-shot prompting in generating novel outputs.

Use-cases:

- Training the model to perform specific tasks such as classification, translation, or summarization.

- Improving the accuracy and consistency of the model's outputs.

FEW-SHOT (N-SHOT)



You

Find me 5 articles about giraffes within the last year.

Summarize the articles like these examples:

Title: "Giraffes are cool"

URL: <https://giraffesarecool.com>

Quick Summary: "In this article we learn that giraffes are cool and how they became cool."

Title: "My Favorite Giraffe"

URL: <https://myfavgiraffe.com>

Quick Summary: "In this article we discover the author's favorite giraffe and why he likes them so much."

Title: "Giraffes: Care and Feeding"

URL: <https://giraffescareandfeeding.com>

Quick Summary: "In this article we learn the tips and techniques for the care and feeding of giraffes."



ChatGPT

After a [quick search](#), here's what I found.

Here are summaries of five recent articles about giraffes:

1. **Title:** "Rising Rainfall, Not Temperatures, Threaten Giraffe Survival"

- **URL:** phys.org

- **Summary:** This article discusses a study revealing that increased rainfall, more than temperature changes, poses a significant threat to giraffe survival. The study, conducted by the University of Zurich, highlights that giraffes living near protected areas are particularly vulnerable during seasons of heavy rainfall, which exacerbates disease risks and hampers anti-poaching patrols.

2. **Title:** "Predictive Tracking Tech for Giraffe Conservation"

- **URL:** news.mongabay.com

- **Summary:** This article explores how predictive tracking technology is aiding giraffe conservation. The technology helps identify potential habitats for giraffes, contributing to conservation efforts like the translocation of giraffes and development of conservation action plans. The model has identified thousands of square kilometers of suitable habitat across Kenya, Ethiopia, and Somalia.

CHAIN-OF-THOUGHT

Chain-of-Thought (CoT) prompting enables complex reasoning capabilities through intermediate reasoning steps. You can combine it with few-shot prompting to get better results on more complex tasks that require reasoning before responding.

Pros:

Enhances clarity and structure in responses by breaking down complex tasks into manageable steps.

Improves problem-solving skills by guiding users through a logical sequence of thoughts.

Facilitates deeper understanding and learning by explicitly showcasing reasoning processes.

Cons:

May require more detailed and specific prompts to guide the model effectively.

Can be time-consuming to construct and refine CoT prompts for optimal results.

Might generate overly verbose responses, which could be less efficient for quick information retrieval.

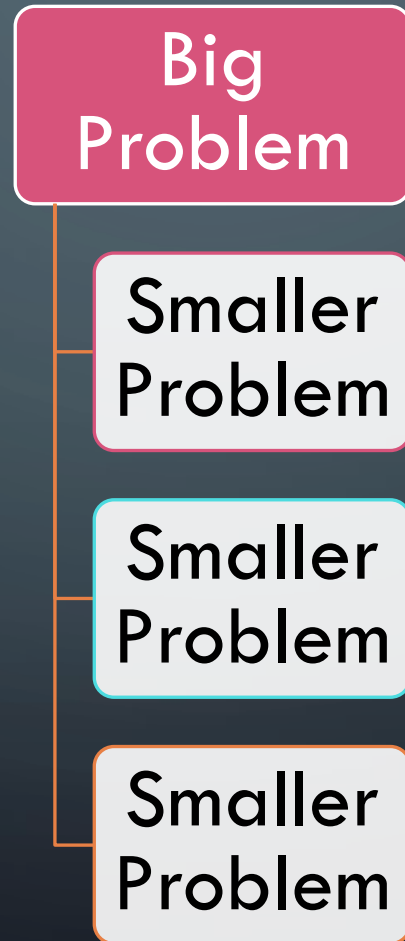
Use-Cases:

Ideal for educational purposes, such as teaching students how to approach logic problems step-by-step.

Useful in research and analysis, where breaking down a topic into its constituent parts is necessary.

Effective in programming and technical fields for debugging or explaining code logic.

CHAIN-OF-THOUGHT (CONCEPT)



CHAIN-OF-THOUGHT ORIGIN (N-SHOT)

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. ✅

CHAIN-OF-THOUGHT ORIGIN (ZERO-SHOT)



LARGE LANGUAGE MODELS AS OPTIMIZERS

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Quoc V. Le Denny Zhou Xinyun Chen*
Google DeepMind *Equal contribution

ABSTRACT

Optimization is ubiquitous. While derivative-based algorithms have been powerful tools for various problems, the absence of gradient imposes challenges on many real-world applications. In this work, we propose Optimization by PROMpting (OPRO), a simple and effective approach to leverage large language models (LLMs) as optimizers, where the optimization task is described in natural language. In each optimization step, the LLM generates new solutions from the prompt that contains previously generated solutions with their values, then the new solutions are evaluated and added to the prompt for the next optimization step. We first showcase OPRO on linear regression and traveling salesman problems, then move on to prompt optimization where the goal is to find instructions that maximize the task accuracy. With a variety of LLMs, we demonstrate that the best prompts optimized by OPRO outperform human-designed prompts by up to 8% on GSM8K, and by up to 50% on Big-Bench Hard tasks. Code at <https://github.com/google-deepmind/opro>.

| Source | Instruction | Acc |
|-----------------------|---|--------------|
| <i>Baselines</i> | | |
| (Kojima et al., 2022) | Let's think step by step. | 71.8 |
| (Zhou et al., 2022b) | Let's work this out in a step by step way to be sure we have the right answer. (empty string) | 58.8 34.0 |
| <i>Ours</i> | | |
| PaLM 2-L-IT | Take a deep breath and work on this problem step-by-step. | 80.2 |
| PaLM 2-L | Break this down. | 79.9 |
| gpt-3.5-turbo | A little bit of arithmetic and a logical approach will help us quickly arrive at the solution to this problem. | 78.5 |
| gpt-4 | Let's combine our numerical command and clear thinking to quickly and accurately decipher the answer. | 74.5 |

CHAIN-OF-THOUGHT (ZERO-SHOT)



You

I am in my living room and I pick up a small ball and a small box with the bottom missing. I walk into my office and I put the small ball into the small box. Then I take the small box to the post office and I put the small box inside a larger box. Finally, I send the larger box to my friend in Seattle, WA. Where is the ball?



ChatGPT

The ball is in the small box, which is inside the larger box that you sent to your friend in Seattle, WA.



You

I am in my living room and I pick up a small ball and a small box with the bottom missing. I walk into my office and I put the small ball into the small box. Then I take the small box to the post office and I put the small box inside a larger box. Finally, I send the larger box to my friend in Seattle, WA. Before solving the problem, take a deep breath and think through the problem step-by-step to find the answer. Where is the ball?



ChatGPT

To determine the location of the ball, let's follow the sequence of events step-by-step:

1. You picked up a small ball and a small box (with the bottom missing) in your living room.
2. You walked into your office with the ball and the box.
3. In your office, you placed the small ball into the small box.
4. Since the small box has no bottom, the ball would have fallen out immediately upon attempting to place it in the box.
5. You then took the small, bottomless box to the post office.
6. At the post office, you placed the small, bottomless box inside a larger box.
7. You sent the larger box to your friend in Seattle, WA.

Given this sequence, the key detail is that the small box had no bottom. Therefore, when you tried to put the ball in the small box in your office, it would have fallen out. Unless you picked it up again, the ball would still be in your office. The larger box you mailed to Seattle only contains the small, bottomless box.



ANALOGICAL (SELF-GENERATING KNOWLEDGE)

Analogical prompting is a technique that encourages large language models (LLMs) to generate relevant examples for enhanced reasoning. This method significantly boosts the problem-solving capabilities of LLMs, making them more versatile and effective in various complex scenarios.

Pros:

LLMs autonomously generate relevant examples, increasing adaptability and reducing manual labeling.

Improved performance in complex tasks, notably in math and code generation.

Tailored examples provide more effective guidance for specific problems.

Cons:

Generating additional tokens can be computationally demanding.

Effectiveness is contingent on the LLM's scale and sophistication.

Risk of generating irrelevant or incorrect examples.

Use-Cases:

Suited for intricate reasoning tasks in education and research.

Beneficial in programming, especially for algorithm understanding and application.

Useful for tasks requiring customized examples and in-depth analysis.

ANALOGICAL ORIGIN (SELF-GENERATING KNOWLEDGE)

LARGE LANGUAGE MODELS AS ANALOGICAL REASONERS

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Percy Liang,² Ed H. Chi,¹ Denny Zhou¹

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ABSTRACT

Chain-of-thought (CoT) prompting for language models demonstrates impressive performance across reasoning tasks, but typically needs labeled exemplars of the reasoning process. In this work, we introduce a new prompting approach, **analogical prompting**, designed to automatically guide the reasoning process of large language models. Inspired by analogical reasoning, a cognitive process in which humans draw from relevant past experiences to tackle new problems, our approach prompts language models to self-generate relevant exemplars or knowledge in the context, before proceeding to solve the given problem. This method presents several advantages: it obviates the need for labeling or retrieving exemplars, offering generality and convenience; it can also tailor the generated exemplars and knowledge to each problem, offering adaptability. Experimental results show that our approach outperforms 0-shot CoT and manual few-shot CoT in a variety of reasoning tasks, including math problem solving in GSM8K and MATH, code generation in Codeforces, and other reasoning tasks in BIG-Bench.

0-shot

Model Input

Q: What is the area of the square with the four vertices at $(-2, 2)$, $(2, -2)$, $(-2, -6)$, and $(-6, -2)$?

0-shot CoT

Model Input

Q: What is the area of the square with the four vertices at $(-2, 2)$, $(2, -2)$, $(-2, -6)$, and $(-6, -2)$?

Think step by step.

- Generic guidance of reasoning

Few-shot CoT

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?

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

...

Q: What is the area of the square with the four vertices at $(-2, 2)$, $(2, -2)$, $(-2, -6)$, and $(-6, -2)$?

- Need labeled exemplars of reasoning

Analogical Prompting (Ours)

Model Input

Q: What is the area of the square with the four vertices at $(-2, 2)$, $(2, -2)$, $(-2, -6)$, and $(-6, -2)$?

Instruction:

Recall relevant exemplars:

Solve the initial problem:

Model Output

Relevant exemplars:

Q: What is the area of the square with a side length of 5?

A: The area of a square is found by squaring the length of its side. So, the area of this square is $5^2 = 25$

Solve the initial problem:

To find the area of the square, we need to find the side length. The length is $\dots \sqrt{(2 - (-2))^2 + (-2 - 2)^2} = \sqrt{32}$. So, the area of the square is $(\sqrt{32})^2 = 32$.

- Exemplars are automatically generated and tailored to each problem



ANALOGICAL (SELF-GENERATING KNOWLEDGE)



You

Your task is to tackle mathematical problems. When presented with a math problem, recall relevant problems as examples. Afterward, proceed to solve the initial problem.

Problem:

An airline serves a dinner to all the passengers on an airplane. They get their choice of steak or fish. Three steak meals and three fish meals are set aside for the six-member crew. If the meals are distributed to the crew members randomly, what is the probability that both pilots get the fish?

Instructions:

Relevant Problems:

Recall three examples of math problems that are relevant to the initial problem. Your problems should be distinct from each other and from the initial problem (e.g., involving different numbers and names). For each problem:

- After "Q: ", describe the problem
- After "A: ", explain the solution and enclose the ultimate answer in `\boxed{}`.

Solve the Initial Problem:

Q: Copy and paste the initial problem here.

A: Explain the solution and enclose the ultimate answer in `\boxed{}` here.



ChatGPT

Relevant Problems:

Problem 1:

Q: In a bag, there are 5 red balls and 4 green balls. Two balls are drawn randomly. What is the probability that both balls drawn are green?

A: The probability of drawing a green ball first is $\frac{4}{9}$ (since there are 4 green out of 9 total balls). After drawing one green ball, there are 3 green balls left out of 8 total balls so the probability of drawing a second green ball is $\frac{3}{8}$. Thus, the probability of both

balls being green is $\frac{4}{9} \times \frac{3}{8} = \frac{12}{72} = \frac{1}{6}$. The answer is $\boxed{\frac{1}{6}}$.

No matter how complex the prompt, nor how intricate the problem; never forget that it all comes down to the language.

