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Artificial intelligence and Large Language Models (LLMs): Advancing colorectal cancer research and quality in practice.

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Outline

I. How do LLMs work?
II. What is prompt engineering?
III. Applications to CRC research and quality

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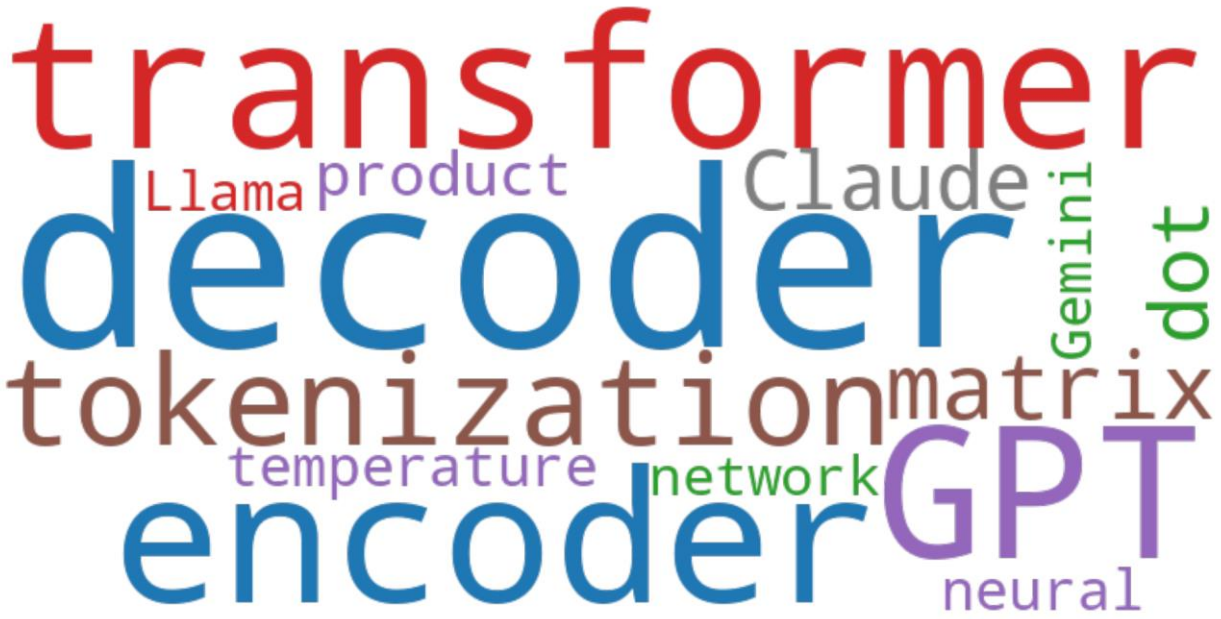
I. How do LLMs work?



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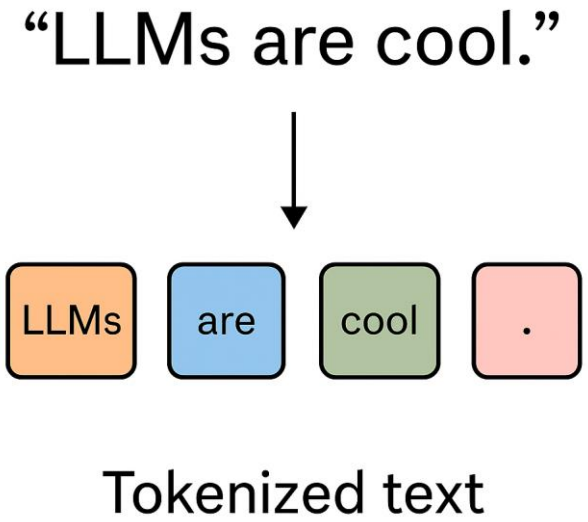
Tokenization

- The first step in processing, taking input text into defined bits, called tokens



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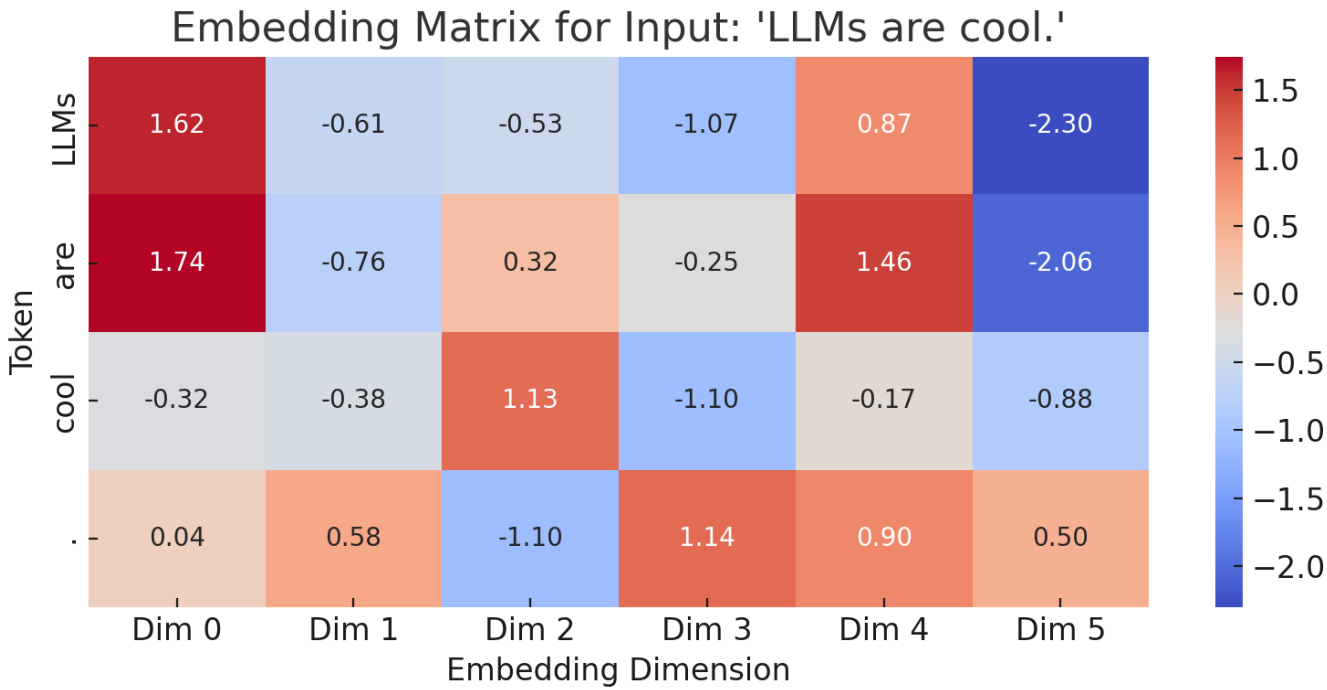
Embedding



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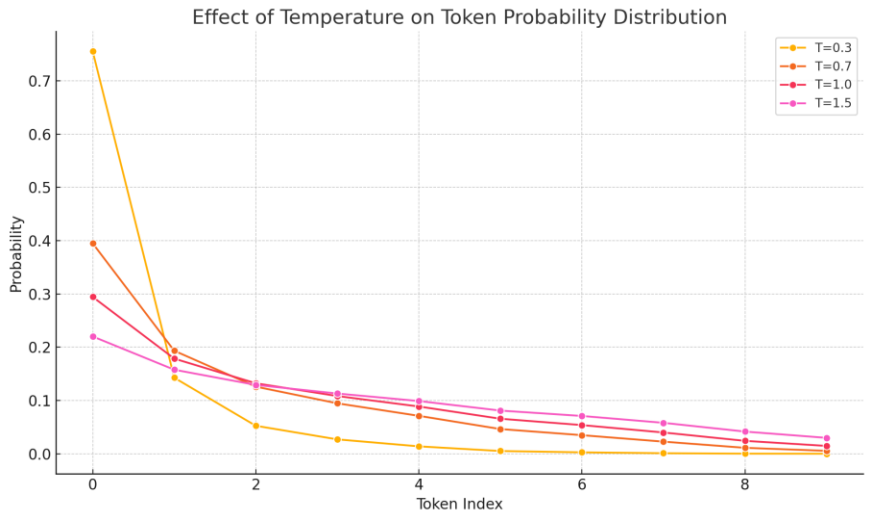
Decoder and temperature

- Decoders generate text by predicting one token at a time

- Temperature modifies the probability distribution of the next-token choice



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The future of artificial intelligence is

Temperature 0.3:

“The future of artificial intelligence is closely tied to advancements in machine learning, data processing, and ethical regulation. It is expected to improve efficiency and decision-making across industries.”

Temperature 1.0:

“The future of artificial intelligence is a kaleidoscope of possibilities, from sentient machines co-authoring novels to neural webs dreaming up new realms of physics.’

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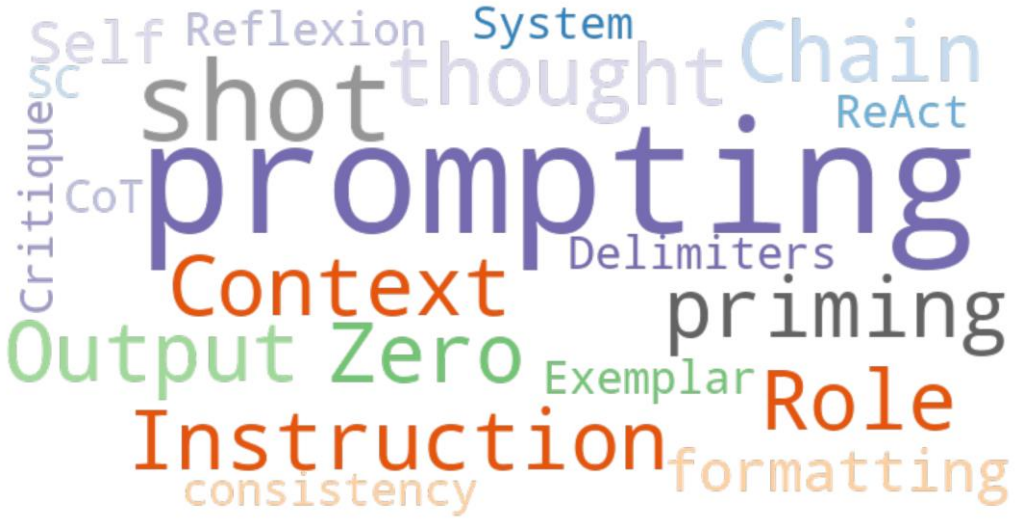
II. What is prompt engineering?

Designing a 

to optimize

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X-shot prompting

- X refers to the number of examples given before asking the question

Task: Recommend colon cancer screening

Example 1:

Patient: 52-year-old average-risk individual
Recommendation: Routine colonoscopy screening every 10 years.

Example 2:

Patient: 45-year-old with a first-degree relative diagnosed with colon cancer at age 50
Recommendation: Begin colonoscopy now; screen every 5 years.

Patient: 60-year-old with no FHx, prior normal colonoscopy at age 50
Recommendation:

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Chain of thought

Patient: A 40-year-old woman with a father who was diagnosed with colon cancer at age 52.

Step-by-step reasoning:

1. The patient is 40 years old.
2. She has a **first-degree relative** (father) with CRC diagnosed at age 52.
3. Guidelines recommend **starting screening at age 40 or 10 years before the relative's diagnosis**, whichever comes first.
4. Since she is already 40 and her father was diagnosed at 52, it is time to begin screening.

Answer: Yes, she should begin colorectal cancer screening now.

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III. Applications

- LLMs are able to effectively extract colonoscopy and pathology data
  - Accelerate research cohort curation
  - Ease ability to participate in quality reporting
  - Real-time feedback, note generation (MLLMs)

- Major limitation is the current inability to deploy LLMs widely, rather than the ability of the LLMs themselves

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Questions?

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