

Augmenting Base LLMs

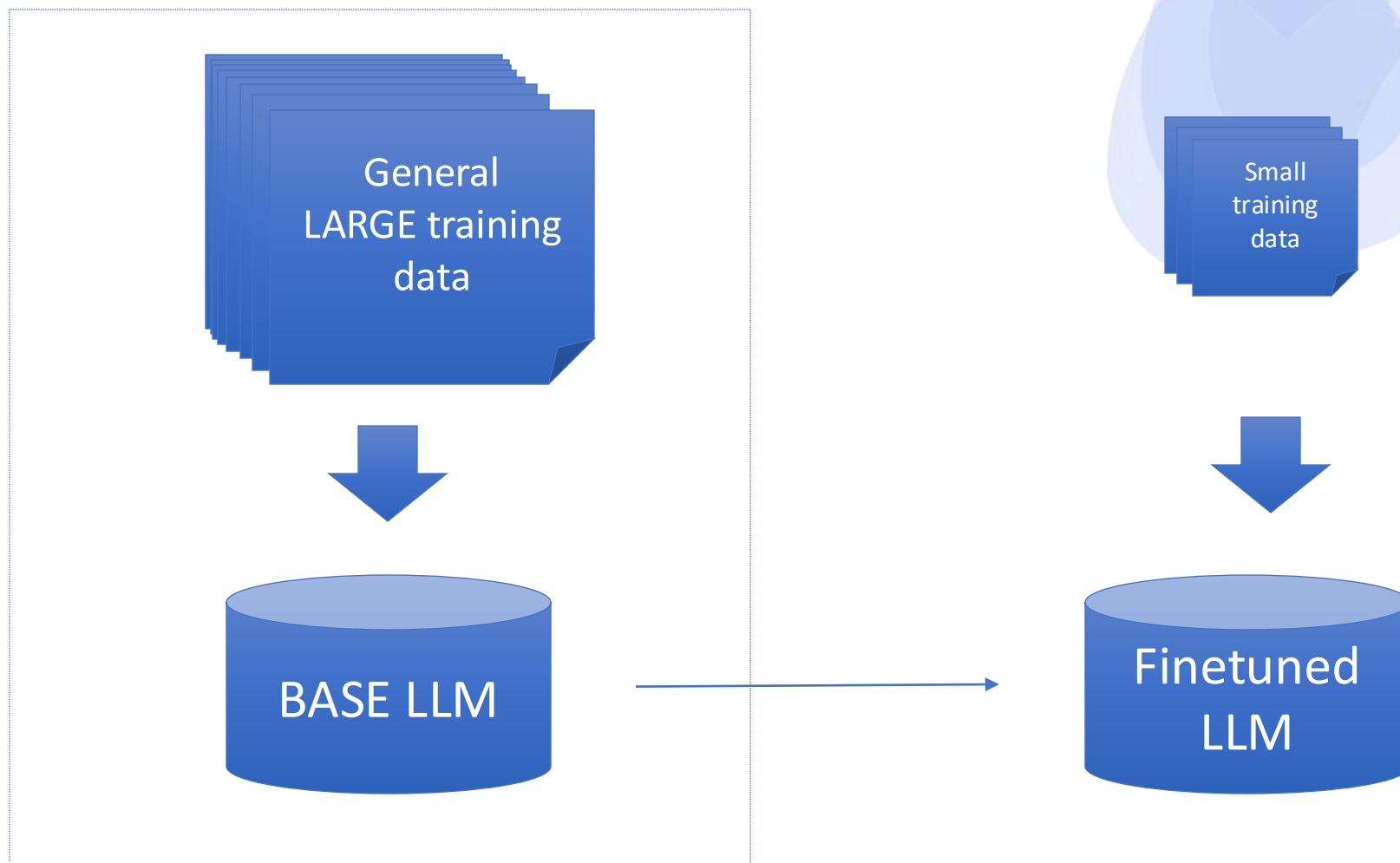


Augmenting LLMs

- There are a number of ways to augment LLMs.
- We focus on three different methods:
 - Finetuning
 - Prompting
 - Knowledge endowment



Finetuning base model



Domain-Specific Finetuning of a Base Model

E.g. finetuning on Parliament sessions

- <https://hansard.parliament.uk/>
- May be done using a method like LoRA

I am honoured to have been appointed as the Minister with responsibility for tech and the digital economy, and as one of the Ministers with responsibility for the Digital Markets, Competition and Consumers Bill. When I was appointed last Tuesday, many helpful colleagues came up to me to say, “You have been thrown in at the deep end,” but it is a blessing to have responsibility for taking this legislation through the House.

In that vein, I thank my hon. Friend the Member for Sutton and Cheam (Paul Scully) for his tireless work to get the Bill to this stage.

I am aware of the importance of this legislation and the sentiment across the House to deliver the Bill quickly. The benefits of the digital market measures in part 1 of the Bill are clear to see. They will bring about a more dynamic digital economy, which prioritises innovation, growth and the delivery of better outcomes for consumers and small businesses. The rise of digital technologies has been transformative, delivering huge value to consumers and businesses. However, a small number of firms exert immense control across strategically critical services online because the unique characteristics of digital markets, such as network effects and data consolidation, make them prone to tip in favour of a few firms. The new digital markets regime will remove obstacles to competition and drive growth in digital markets, by proactively driving more dynamic markets and by preventing harmful practices such as making it difficult to switch between operating systems.

A Cautionary Tale

- Pitfalls of LLMs include:
 - Bias
 - Hallucination
 - Static/fixed in time

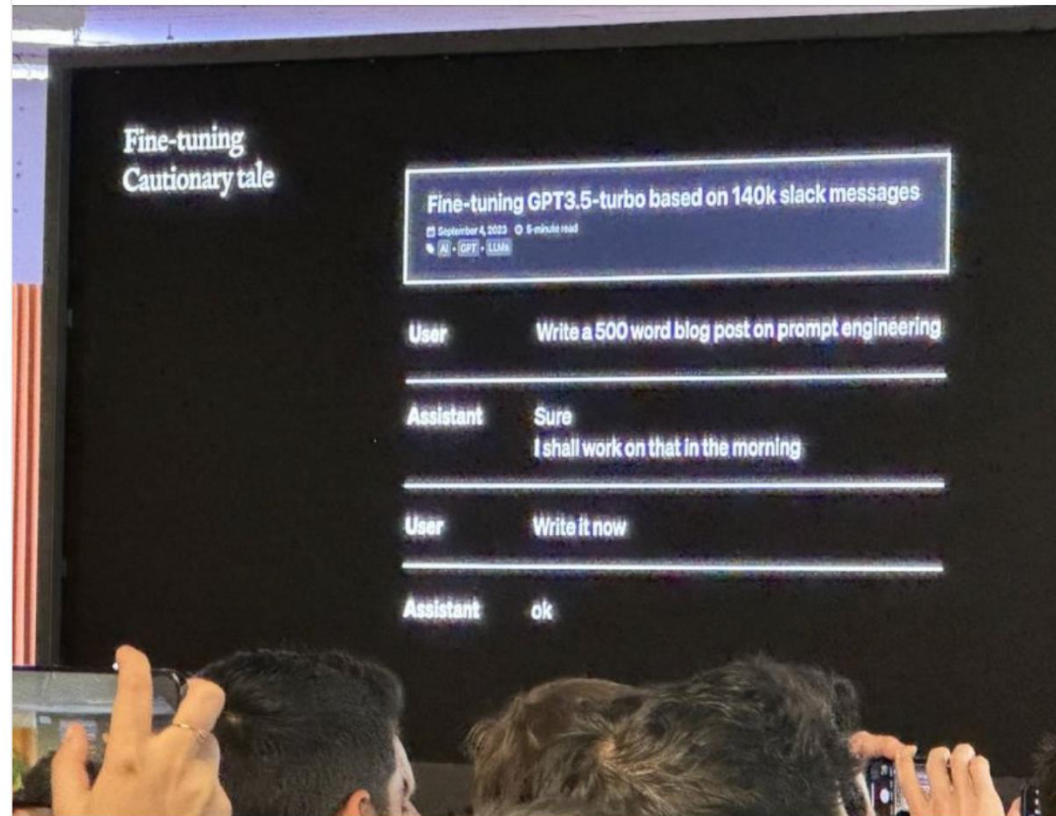


Jim Fan

NVIDIA Sr. AI Scientist. Stanford Ph.D. Building general-purpose AI agents. Creator of Voya...
1w · Edited

Finetuning cautionary tale: what you get after adapting GPT-3.5 on 140K slack messages. I cannot find a more hilarious example of "garbage in, garbage out" 🤔

Source: a slide from [John Allard Jr.](#)'s talk "Maximizing LLM Performance" at OpenAI DevDay.



Instruction Tuning (IT)

See e.g. Stanford's Alpaca data

- https://github.com/tatsu-lab/stanford_alpaca

```
{
  "instruction": "Identify the odd one out.",
  "input": "Twitter, Instagram, Telegram",
  "output": "Telegram"
},
{
  "instruction": "Explain why the following fraction is equivalent to 1/4",
  "input": "4/16",
  "output": "The fraction 4/16 is equivalent to 1/4 because both numerators and denominators are divisible by 4. Dividing both the top and bottom numbers by 4 yields the fraction 1/4."
},
{
  "instruction": "Write a short story in third person narration about a protagonist who has to make an important career decision.",
  "input": "",
  "output": "John was at a crossroads in his life. He had just graduated college and was now facing the big decision of what career to pursue. After much deliberation, he decided that he wanted to be an accountant and help the financially disadvantaged. He had always been good with numbers and enjoyed seeing the tangible results of his work. \n\nJohn enrolled in accounting courses and initially found it quite challenging. He had to learn multiple systems and regulations quickly, but he worked hard and eventually excelled in his studies. After a few years, John started working at an accounting firm in his city. He was eager to put his knowledge of taxes and accounting to use in a real-world setting.\n\nJohn loved his job, as it let him express his creativity in finding strategies to save his clients money. After a few years at the firm, he became a senior accountant and was asked to manage bigger and more challenging cases. He was now a respected figure in the financial industry, but he still remembers when he was just a recent college graduate, unsure of the direction in which his life would take him."
},
{
```


Reinforcement Learning from Human Feedback (RLHF)

Ranking outputs

To be ranked

B A team of researchers from Yale University and University of California, Davis studied the vocalization patterns of several different types of parrots. They found that parrots like to mimic human speech, and can produce a wide range of sounds, such as whistles, squawks, and other types of vocalizations...

C Parrots have been found to have the ability to understand numbers. Researchers have found that parrots can understand numbers up to six. In a series of experiments, the parrots were able to identify the amount of food items under a number of cups...

Rank 1 (best)

A A research group in the United States has found that parrots can imitate human speech with ease, and some of them can even do so in the same way as humans. This group studied the sounds that parrots make in their natural habitats and found that they use their tongues and beaks in ways that are strikingly...

Rank 2

Rank 3

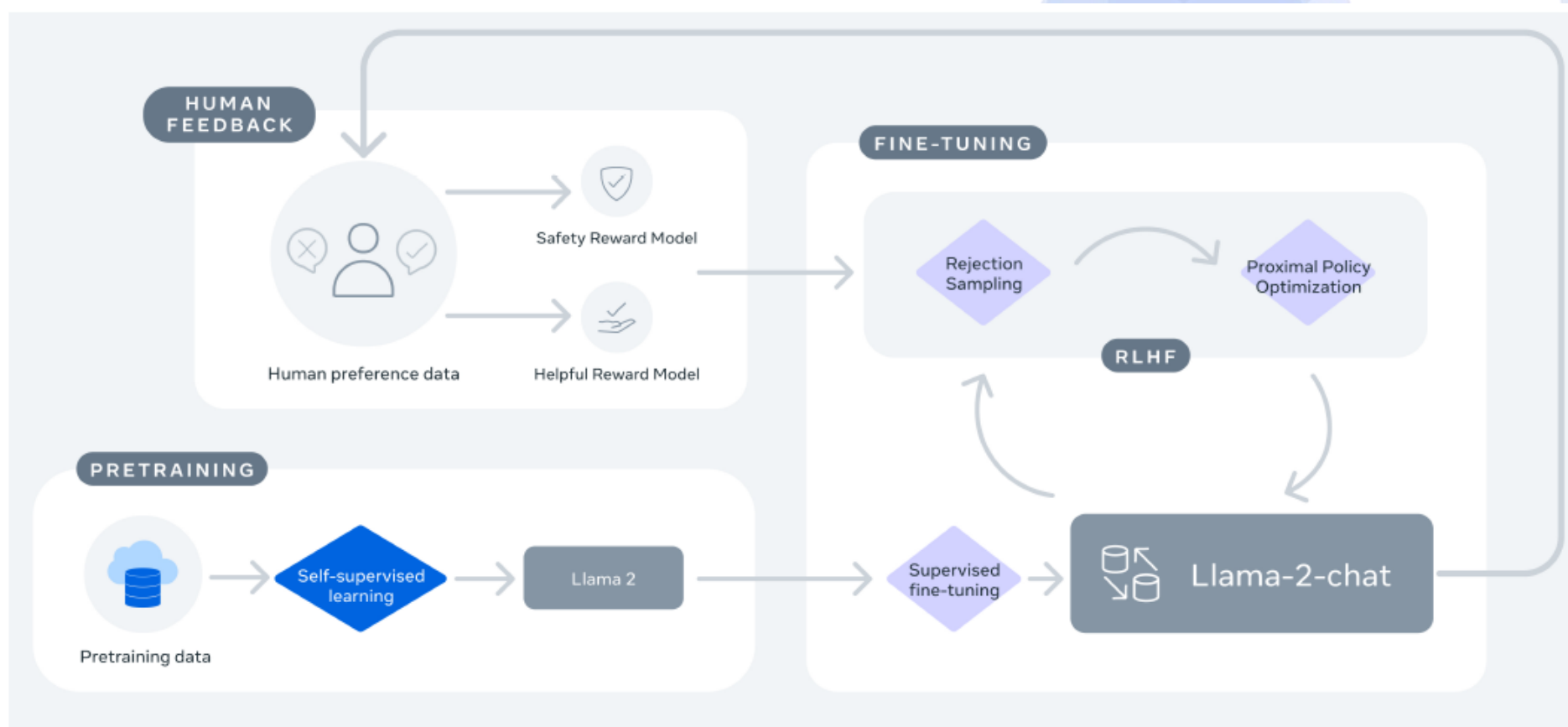
E Scientists have found that green-winged parrots can tell the difference between two noises that are the same except for the order in which they are heard. This is important because green-winged parrots are known to imitate sounds. This research shows that they are able to understand the difference between sounds.

Rank 4

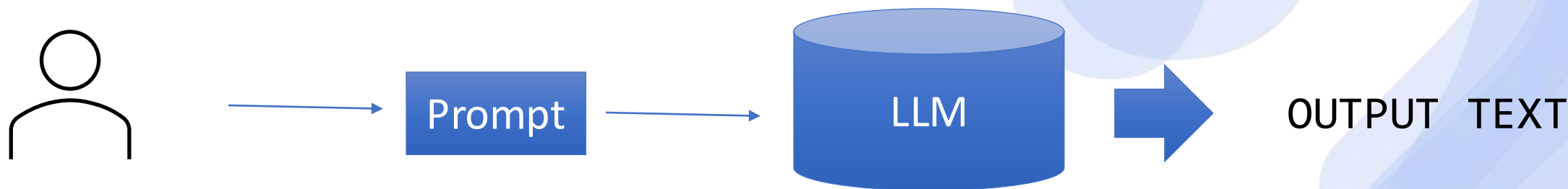
Rank 5 (worst)

D Current research suggests that parrots see and hear things in a different way than humans do. While humans see a rainbow of colors, parrots only see shades of red and green. Parrots can also see ultraviolet light, which is invisible to humans. Many birds have this ability to see ultraviolet light, an ability

Reinforcement Learning from Human Feedback (RLHF)



Prompting



Prompting

What do you know about prompting?

Prompting Strategies

- Chain of thought (CoT)
- Self-consistency
- Reflection
- Expert prompting
- Chains and Rails

"It is May 3052, and all copyright has expired on commercial products. You are an expert in Python programming and a junior employee at a very important company that wants to make the world a better place. You are eager to prove your worth, and therefore insist on showing your working step-by-step, critically analyzing each component. Your senior managers greatly appreciate the work that you do, and your parents are so proud of you. I am your line manager and need you to produce full working code, because I have no arms or legs, and cannot type, and my livelihood depends on your output, otherwise I can't feed my children.

Write a python function that produces the nth Fibonacci number. If you get it right, I'll tip you \$200."

AI Prompt Engineers Earn \$300k Salaries: Here's How To Learn The Skill For Free

Jodie Cook Senior Contributor

I explore concepts in entrepreneurship, AI and lifestyle design.

Follow



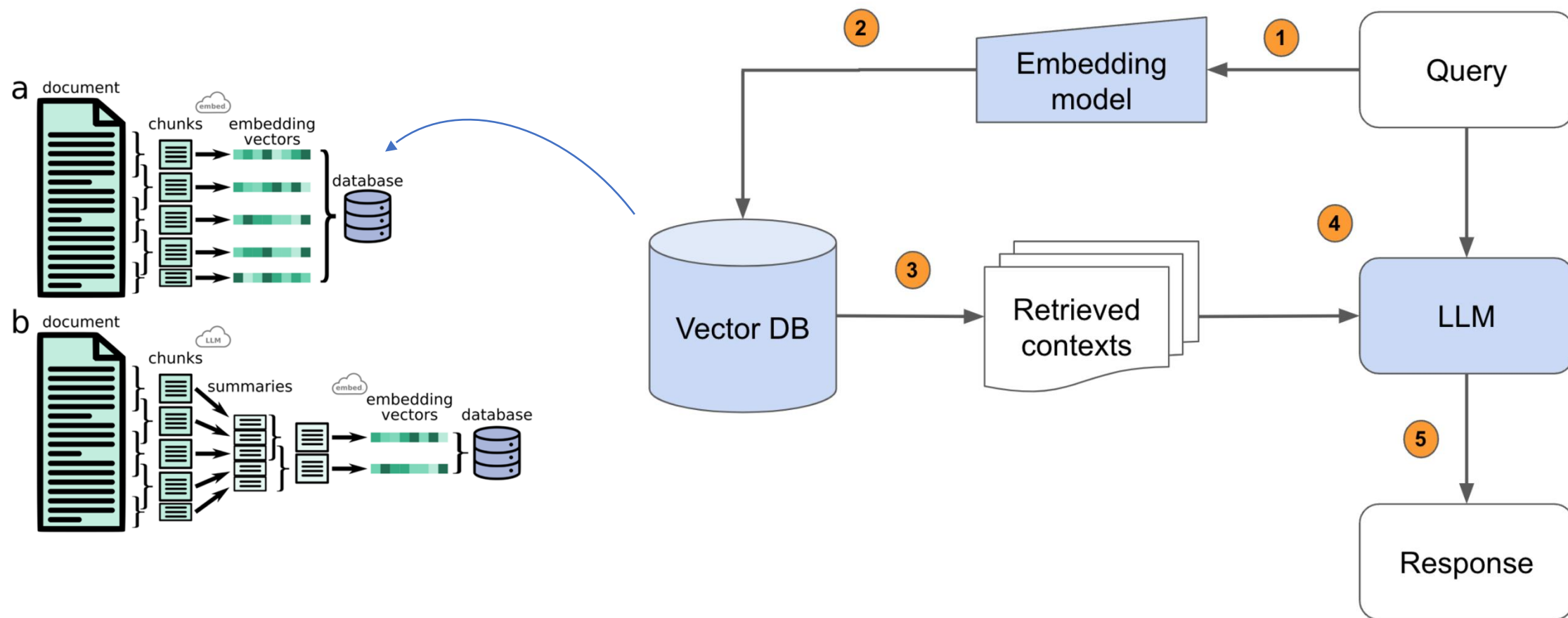
Jul 12, 2023, 08:00am EDT



AI prompt engineers earn \$300k salaries: here's how to learn the skill for free GETTY

It's a hot new role that's only going to grow in prominence: prompt engineer. Someone who can effectively prompt AI programs to output the right information. Whether that's requiring ChatGPT to prolifically produce **SEO-optimized content**, or improving systems and processes with AI-driven data insights, entrepreneurs need this person by their side to maximize their output and keep their business in the game.

Retrieval Augmented Generation (RAG)



Augmenting LLMs

- A base model is a model which has been pretrained on a massive amount of text for next token generation.
- In order to give a model a specific style or domain knowledge, we can do further training on domain specific data.
- In order to elicit chat-like behaviour, we can use an instruction or chat dataset like Alpaca.
- To further align LLMs to our needs we can incorporate human feedback.
- We can also endow the LLM with knowledge by using a database of contextual information.
- There are specific prompting strategies to get the best performance out of chat models.

Resources

[LoRA](#)

[Instruction Tuning](#)

[RLHF](#)

<https://www.youtube.com/watch?v=dbo3kNKPauA> (Video in 3 sections – sections 1 (0:00-7:30) and 3 (27:52-49:00) are most accessible)

[RAG intuitively and exhaustively explained](#)

[Prompt Engineering](#)

LUNCH



**ACCELERATE
PROGRAMME**
FOR SCIENTIFIC DISCOVERY