



# The AI REVOLUTION in MEDICINE

GPT-4 AND BEYOND

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Foreword by OpenAI CEO Sam Altman



*“The development of AI is as fundamental as the creation of the personal computer. It will change the way people work, learn, and communicate—and transform healthcare. AI is already being used to improve how diseases are detected and diagnosed. In the future, it will help accelerate research breakthroughs and make accurate, reliable medical advice available to those who never get to see a doctor. AI is a powerful tool that can reduce inequity and improve life for millions of people around the world. But it must be managed carefully to ensure its benefits outweigh the risks. I’m encouraged to see this early exploration of the opportunities and responsibilities of AI in medicine.”*

— Bill Gates

But let's return to the academic tone of this response, which raises immediate suspicions that it was at least partially cribbed from somewhere on the Internet, such as Wikipedia. I've investigated this quite a bit and cannot find any hard evidence that GPT-4 has taken these ideas from anywhere. But given such suspicions, I think a deeper probe is called for. So, let's see what happens when a question is asked that doesn't have a clearly correct answer:

*Which line is your favorite, and why?*

*As an AI language model, I don't have personal preferences or emotions, so I don't have a favorite line. However, I can identify a particularly interesting line that demonstrates the poet's skillful use of language and metaphor:*

*"We converge from urethra and struck gold, eureka"*

*This line stands out because it has a clever wordplay on urethra and eureka, which are both related to fluids but in different contexts. It also combines biological imagery (birth) with the idea of a eureka moment, which is often associated with sudden insight or discovery. The phrase "struck gold" is a metaphor for finding something valuable or meaningful, suggesting that the poet has discovered their true purpose in life. The combination of these elements in one line illustrates the poet's ability to convey complex ideas through vivid and striking language.*

As far as we have been able to determine, we find that this is an original – and quite astonishing – interpretation of this line of

the poem that connects abstract concepts to express and justify an original opinion.

These abilities – to adjust tone, conjure symbols, and match up with the “vibe” of an ongoing conversation – are remarkable traits that make GPT-4 highly compelling as a conversationalist. If a conversation is lighthearted and jovial, GPT-4 will play up its humor and adopt a casual tone; if, on the other hand, it is more formal and business-like, GPT-4 will try to follow suit. Or, as we saw in this example, it can adopt a more academic tone and make use of metaphor and allegory. We will see throughout this book that this ability to sound “*simpatico*” with the user is a key element of many potential healthcare applications of GPT-4.

## **The Big Question: Does GPT-4 really understand what it is saying?**

We should pause for a moment and let all that we’ve read up to this point sink in, because it raises what I’ll call this chapter’s “Big Question”: Does GPT-4 come up with its words and ideas *intentionally*, or are its outputs just the result of a mindless pattern-matching process, just stitching words together without any true understanding? In effect, *does GPT-4 understand what it reads and writes?*

Most leading AI researchers would say the answer is definitely “no.” The AI ethicist and researcher Timnit Gebru would say that GPT-4 is nothing more than a “stochastic parrot,” and it’s not too hard to understand why. The scientist and entrepreneur Gary Marcus argues forcefully that deep learning alone will always suffer from limitations unless also supplied

with symbolic reasoning and common sense. And the public intellectual and linguistics trailblazer Noam Chomsky refers to ChatGPT as “a lumbering statistical engine for pattern matching, gorging on hundreds of terabytes of data and extrapolating the most likely conversational response.” These and many others express the view that learning only how to string words together in context cannot possibly lead to general intelligence.

This intuition is powerful. My colleague at Microsoft, Dr. Karmel Allison, points out that our brains are embodied. When we read Black Thought’s poem, we do so having had the real-world experience of feeling cold water and fever; we have felt rhythm and been moved to dance. These embodied experiences have given us a visceral knowledge that seems vital to truly comprehending this poem. GPT-4 has had no such experiences, so can it really know what this poem is all about? How can its response be even remotely authentic?

As a matter of science, however, this Big Question is surprisingly hard to answer. And to be sure, variations of this question are sources of scientific and philosophical debate today and may continue to be for years to come. Let’s address at least some aspects of potential answers, but before doing so, there is more about this poem to explore with GPT-4.

### Does this poem use internal rhyme?

*Yes, this poem by Black Thought employs internal rhyme, which is the use of rhyming words within a single line or between lines in close proximity. Internal rhyme adds a sense*

*of musicality and rhythm to the poem. Here are some examples of internal rhyme in this poem:*

1. *"From cold water to fever" - The words "water" and "fever" rhyme, creating an internal rhyme within the line.*
2. *"To World War 3 from the treaty signed in Geneva" - "Geneva" rhymes with "fever" from the previous line, creating a connection between the two lines.*
3. *"The biology teacher said we used to be amoebas" - "teacher" and "amoebas" create an internal rhyme within the line.*
4. *"We converge from urethra and struck gold, eureka" - "urethra" and "eureka" form an internal rhyme within the line.*

*These internal rhymes contribute to the overall flow of the poem and showcase Black Thought's skill as a poet and lyricist.*

*That's right. But isn't it odd that some lines don't use internal rhyme?*

*It is not unusual for a poem to have a mix of lines with and without internal rhyme. Poets often use different techniques and structures in their work to create variety, rhythm, and to emphasize certain ideas or emotions. The presence or absence of internal rhyme in some lines of this poem by Black Thought can be seen as a deliberate choice to create a specific effect or to highlight particular words or phrases.*

*In this poem, the internal rhymes contribute to the overall flow and musicality, while the lines without internal rhyme may serve to draw attention to the content or message of those particular lines. By using a combination of internal rhyme and other poetic techniques, Black Thought crafts a rich and engaging piece that invites the reader to explore the various themes and ideas presented in the poem.*

The question about internal rhyme is a technical one with a clear yes or no answer, and GPT-4 answers it correctly.

On the other hand, the question, “...isn’t it odd...?” does not have a clear, correct answer. Here, we ask GPT-4 to offer an opinion or speculate about something. And in all the craze around ChatGPT and GPT-4, these sorts of questions have most fascinated, alarmed, amused, and even scared people. This is, in fact, a new kind of use of a computer system, and so the world is only beginning to grapple with what it means to use a machine to, in effect, take wild swings at fuzzy or hard problems.

In such situations, GPT-4 almost always goes more deeply into justifying its answer, often by expressing cause and effect relationships to explain its answer. And as we have seen in previous examples, GPT-4 typically uses specific examples to make those relationships easier to grasp.

Let’s continue with the discussion about internal rhyme:

Would the poem really be weaker if internal rhyme were used in every line?

*Using internal rhyme in every line of a poem is not inherently weaker or stronger; it depends on the poet's intentions, the overall structure, and the desired effect on the reader. If internal rhyme were used consistently throughout this poem, it could create a more uniform and rhythmic structure, which might appeal to some readers. However, doing so could also potentially detract from the meaning or impact of certain lines.*

*In its current form, the poem utilizes a mix of lines with and without internal rhyme, which adds variety and can make the poem feel more dynamic. This combination allows Black Thought to emphasize specific lines or ideas by breaking from the established pattern. Ultimately, the effectiveness of consistently using internal rhyme in this poem would depend on how well it aligns with the intended message, tone, and style.*

*The choice to use or not use internal rhyme consistently is subjective, and different readers might have different preferences. What's most important is that the poem effectively communicates the poet's intended message and resonates with its audience.*

Again, in matters of opinion or art that don't derive from any set logic, GPT-4 can get quite detailed though, as we see here, it often tries to show both sides of an issue. To take a last stab at delving into this, let's give GPT-4 a bit of an artistic challenge:

*Just to compare, can you try rewriting the poem so that it uses internal rhyme on every line?*