

# Study reveals how much energy AI uses to answer your questions

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Whether it's answering work emails or drafting wedding vows, generative artificial intelligence tools have become a trusty copilot in many people's lives. But a growing body of research shows that for every problem AI solves, hidden environmental costs are racking up.

Each word in an AI prompt is broken down into clusters of numbers called "token IDs" and sent to massive data centers — some larger than football fields — powered by coal or natural gas plants. There, stacks of large computers generate responses through dozens of rapid calculations.

The whole process can take up to 10 times more energy to complete than a regular Google search, according to a frequently cited estimation by the Electric Power Research Institute.

So, for each prompt you give AI, what's the damage? To find out, researchers in Germany tested 14 large language model (LLM) AI systems by asking them both free-response and multiple-choice questions. Complex questions produced up to six times more carbon dioxide emissions than questions with concise answers.

In addition, "smarter" LLMs with more reasoning abilities produced up to 50 times more carbon emissions than simpler systems to answer the same question, the study reported.

"This shows us the tradeoff between energy consumption and the accuracy of model performance," said Maximilian Dauner, a doctoral student at Hochschule München University of Applied Sciences and first author of the *Frontiers in Communication* study published Wednesday.

Typically, these smarter, more energy intensive LLMs have tens of billions more parameters — the biases used for processing token IDs — than smaller, more concise models.

"You can think of it like a neural network in the brain. The more neuron connections, the more thinking you can do to answer a question," Dauner said.

## What you can do to reduce your carbon footprint

Complex questions require more energy in part because of the lengthy explanations many AI models are trained to provide, Dauner said. If you ask an AI chatbot to solve an algebra question for you, it may take you through the steps it took to find the answer, he said.

"AI expends a lot of energy being polite, especially if the user is polite, saying 'please' and 'thank you,'" Dauner explained. "But this just makes their responses even longer, expending more energy to generate each word."

For this reason, Dauner suggests users be more straightforward when communicating with AI models. Specify the length of the answer you want and limit it to one or two sentences, or say you don't need an explanation at all.

Most important, Dauner’s study highlights that not all AI models are created equally, said Sasha Luccioni, the climate lead at AI company Hugging Face, in an email. Users looking to reduce their carbon footprint can be more intentional about which model they chose for which task.

“Task-specific models are often much smaller and more efficient, and just as good at any context-specific task,” Luccioni explained.

If you are a software engineer who solves complex coding problems every day, an AI model suited for coding may be necessary. But for the average high school student who wants help with homework, relying on powerful AI tools is like using a nuclear-powered digital calculator.

Even within the same AI company, different model offerings can vary in their reasoning power, so research what capabilities best suit your needs, Dauner said.

When possible, Luccioni recommends going back to basic sources — online encyclopedias and phone calculators — to accomplish simple tasks.

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### **Etes-vous capable de reformuler en français les éléments essentiels ?**

#### **1) Complétez les phrases suivantes :**

..... consomme jusqu’à 10 fois plus d’énergie que .....

..... produit six fois plus d’émissions carbone que .....

..... produit 50 fois plus d’émissions carbone que .....

#### **2) Trouvez 5 conseils donnés pour limiter sa consommation d’énergie quand on utilise une IA et formulez-les en français.**

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