

- Future AI might think more like an animal



News

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For their experiments with artificial intelligence, Dr. Steffen Werner and Dr. Michael Coughlan drew inspiration from the ways animals think. Their insights could help to develop neural networks that are more stable, efficient, and versatile.

“Although artificial intelligence is performing impressive feats, Silicon Valley’s big models trained on massive amounts of data have started showing diminishing returns: they are not developing at the pace they used to,” explains Dr. Steffen Werner of the Experimental Zoology Group at Wageningen University & Research. “On top of that, these large models are quite opaque. It’s difficult to understand how they

function, and thus, how they could be improved.” Werner and his colleague Dr. Michael Coughlan went back to basics, experimenting with the smallest possible deep learning algorithms. “As physicists, we strive to understand through simplification, looking for the minimal system,” explains Coughlan.

For their experiments, the scientists drew inspiration from the animal world. “Animal brains have aspects that would be the envy of many artificial models. They can function while they’re still growing, they require less extensive networks, and they can learn more than one task at the same time,” says Werner. “We replicated those qualities in small neural networks, both to see if it was possible and to study them.” The insights gleaned from these models point into new directions for the development of artificial intelligence.

Discovering surprising qualities

“One hurdle artificial intelligence has faced is called catastrophic forgetting,” explains Werner. “Say you’ve trained an AI to recognize handwriting, and now you’re teaching it to recognise shapes. Often, what will happen is that it will forget the first task while learning the second one. In contrast, a lot biological minds can learn several things at once, without ever risking this overwrite.”



Werner and Coughlan trained their experimental AI on a widely-used dataset, the 'Neural Numbers', as they're called, of the Modified National Institute of Standards and Technology.

The scientists succeeded in teaching their model two things at once by continuously alternating between the two tasks during its training period. "Although training does take a little longer, the AI learned to recognise both handwriting and shapes to about the same degree of success as its specialised counterparts. What was interesting, though, was to see that the neural network had partitioned itself into roughly two parts. It used each half for a separate task. We hadn't built it that way, this structure emerged from the training," says Werner.

Werner and Coughlan discovered another surprising quality when they tried to replicate the neurogenesis of animals. "That is the process by which their brains grow. Most important for us was the way biological cognition remains functional all throughout its growing

process. So we wanted to know if an artificial intelligence would break down if we expanded the model while it was already in training,” says Coughlan. “It didn’t. In fact, we were surprised to see an increase in the stability of the training process. Dips in accuracy, not unusual during training, became less frequent.”

Understanding artificial intelligence

The physicists strived, first and foremost, to understand. “These experiments were fueled by our curiosity. We wanted to know more about the similarities, but also the differences, between biological and artificial neural networks,” says Coughlan. The emergent qualities their experiments turned up also beg new questions from the scientists. Werner gives an example. “Does the relative similarity of the two tasks we taught the model relate to the way it partitioned itself into two halves? Would the network look different if the tasks were less similar?”

Still, in a field where the dominant approach has come under scrutiny, it’s research like this that might open up new avenues. The construction of ChatGPT and Gemini, for example, is domineered by an engineering approach. “These models are built to work, not to be understood at every level,” explains Werner. “That would’ve slowed down their development immensely.”

In contrast, DeepSeek, the Chinese AI that shook up the industry in January 2025, came out of a hedge fund domineered by mathematicians. “Like physicists, they would be interested in what makes AI work the way it does,” says Coughlan. That could explain why DeepSeek performs at such an impressive level, while also functioning more efficiently and costing less to build and train. “AI has

shown impressive progress these last few years,” says Werner, “but the recent slump might call for a new approach. Maybe the time has come to slow down and pursue a more scientific understanding of the way artificial intelligence works.”

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