

The buzz on smarter AI

This World Honey Bee Day, meet the tiny creatures inspiring the future of artificial intelligence

By Kelly deVos, ASU News
August 12, 2025

Each year, the third Saturday of August marks [World Honey Bee Day](#) — a moment to reflect on the vital role bees play in our ecosystem and food supply. But this year, the buzz isn't just about pollination. Researchers at Arizona State University are looking to honeybees for answers to a very modern problem: how to build more reliable, more memory-efficient artificial intelligence.

It turns out, even the busiest bees need their rest, and how they sleep may hold secrets that could transform the way AI models learn.

Why sleepy bees matter to smart machines

[Ted Pavlic](#) is an associate professor of industrial engineering and computer science in the [School of Computing and Augmented Intelligence](#), part of the [Ira A. Fulton Schools of Engineering](#) at ASU, with a joint appointment in the [School of Life Sciences](#). He leads a unique interdisciplinary research project that blends biology and computer science.

His team is tackling a well-known challenge in artificial intelligence, or AI, called “catastrophic forgetting.” When AI systems learn one task — say, how to recognize dogs — and are later trained on a new task — like identifying cars — they often forget the first thing they learned.

“Humans don't work that way,” Pavlic says. “We constantly learn new things without forgetting old ones. One hypothesis is that sleep, and specifically memory consolidation during sleep, helps us do that. We wondered if that applied to AI, too.”

Through a collaboration with the University of California San Diego and with support from the [National Science Foundation](#) as part of the [Brain-Inspired Dynamics for Engineering Energy-Efficient Circuits and Artificial Intelligence](#) program, or BRAID, Pavlic's team is studying how to give AI its own version of sleep.

Maksim Bazhenov, a professor of medicine at UCSD, developed an early version of this concept: AI networks that are periodically “unplugged” from input and allowed to reinforce their memories with random signals, like a dream state.

The twist? Pavlic's team is now using honeybees to make that artificial sleep cycle even better.

Bee brains and brainwaves

“We know honeybees sleep, and that depriving them of sleep leads to performance issues,” Pavlic says. “Bees that don’t sleep can’t communicate as well and can’t remember flower locations.”

That’s where Angelica Ellis comes in. An ASU master’s degree student in biology, Ellis has been working in the lab of ASU neuroscientist and Professor [Brian Smith](#), under the close supervision of Research Professor [Hong Lei](#), meticulously recording electrical signals from sleeping honeybee brains.

“My job is to record brain activity from the antennal lobe, the part that processes smell,” Ellis says. “We’re seeing decreases in activity during sleep, and that might tell us how bees consolidate memories.”

By identifying which parts of the bee brain stay active during sleep and which don’t, the team hopes to inspire more targeted and efficient sleep cycles in AI models. Pavlic says that’s important, because AI “dreaming” could help machines retain knowledge better without ballooning in size or requiring constant retraining.

A bee-inspired blueprint for better AI

This isn’t the first time bee biology has inspired engineering. Pavlic’s lab has also designed new kinds of neural networks based on how bees process smells using randomized connections to simplify and compress complex logic systems. The result? Smarter machines that are also smaller and more energy efficient.

“People think the human brain is the gold standard,” Pavlic says. “But bees are solving complex problems with just a million neurons. They’re an incredible example of efficient design. We think that offers a lot to learn from, especially when building AI for phones, sensors or robots that can’t afford huge computing resources.”

And unlike the dramatic, doomsday depictions of AI in movies, this bee-inspired research is refreshingly down-to-earth.

“It’s not about killer robots,” Pavlic says with a laugh. “It’s about finding better ways for machines to keep learning, just like we do.”

Cross-pollinating disciplines

For Ellis, working at the intersection of biology and computer science has been eye-opening.

Why this research matters

Research is the invisible hand that powers America’s progress. It unlocks discoveries and creates opportunity. It develops new technologies and new ways of doing things.

Learn more about ASU discoveries that are contributing to changing the world and making America the world’s leading economic power at researchmatters.asu.edu.

“I never expected to work on AI, but being in this collaborative environment has taught me so much,” she says. “It’s amazing to see how data from tiny brains can impact such high-tech fields. And it’s made me rethink my own path. I now want to pursue clinical research because of what I’ve learned.”

Ellis encourages fellow students to give research a try, even if it seems outside their comfort zone.

“You might discover something totally unexpected that you love,” she says.

Nature’s compass for the future of AI

As the world moves toward increasingly intelligent systems — from self-driving cars to home assistants — there’s a growing need for AI models that are more flexible, more compact and more human-like in how they learn over time.

That’s where the bees come in.

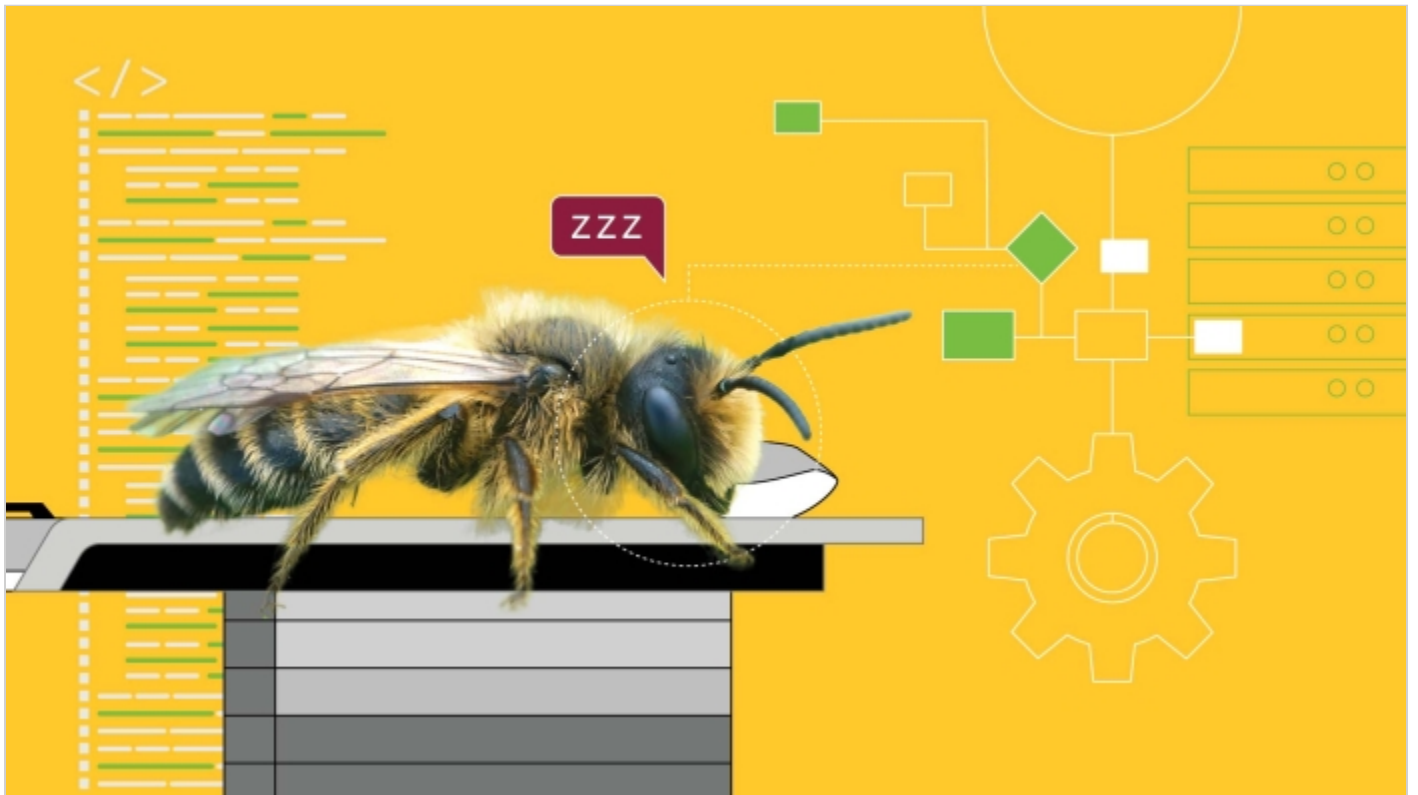
“Nature gives us a compass,” Pavlic says. “There are so many design choices in AI that we can’t explore them all. But the bee brain has already made smart trade-offs we can learn from.”

This World Honey Bee Day, take a moment to appreciate not just the honey, but the humble hive minds behind it. They may be small, but their sleepy little secrets could help shape the future of smarter, more resilient AI.

And that’s something worth buzzing about.

This story originally appeared on [ASU News](#).

Main image



An illustration of a sleeping bee. Ted Pavlic, an associate professor of industrial engineering and computer science in the School of Computing and Augmented Intelligence, part of the Ira A. Fulton Schools of Engineering at Arizona State University, is studying sleeping patterns of honeybees, gaining insights that can be applied to the design of innovative artificial intelligence models. Illustration by Andrea Heser/ASU

Text image(s)



Pavlic at work in his lab. He studies social insects like ants and bees to apply their collective intelligence to industrial and computer engineering solutions. Photo by Erika Gronek/ASU