Enabling optimised brain simulation for all

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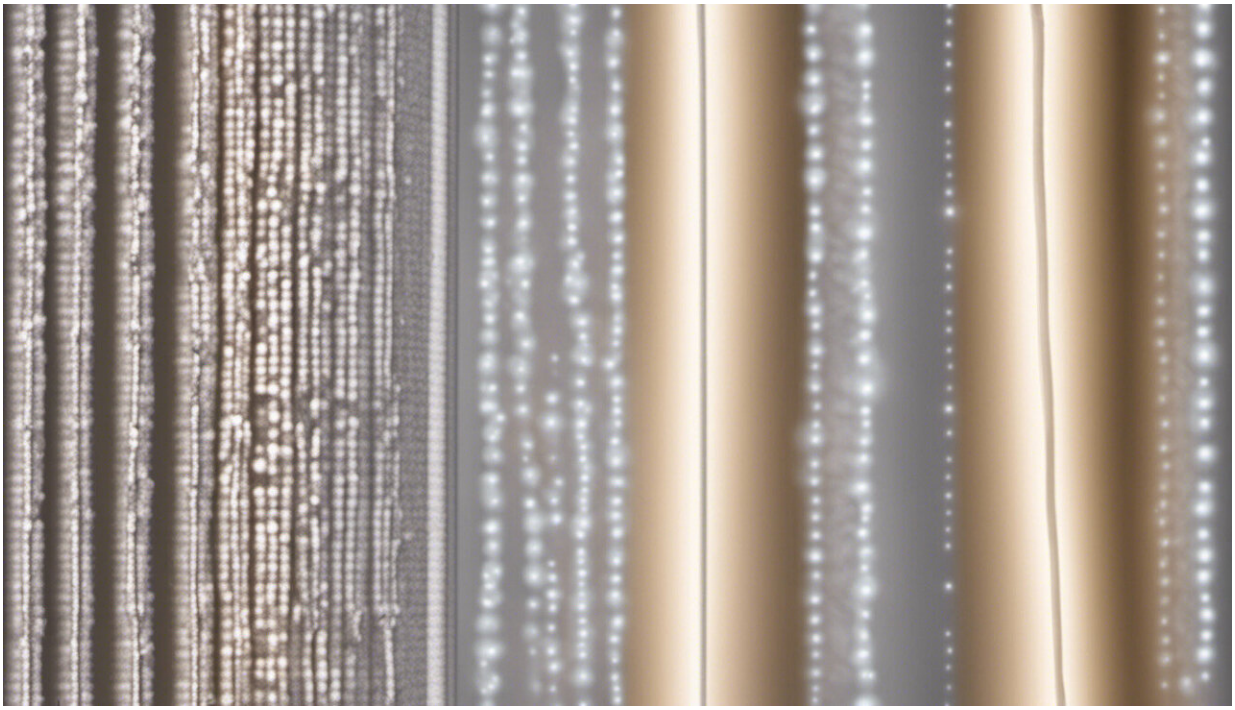

Credit: AI-generated image (disclaimer)

The better we understand the human brain in all its complexity, the more we can use that knowledge to achieve advances in neuroscience, brain medicine and other technological fields. To advance European brain science, the EU-funded HBP SGA3 project has delivered a new digital research infrastructure called EBRAINS that gathers data and tools for brain-related research. EBRAINS has now released an enhanced brain simulation software that could be widely applied in neuroscience and

robotics.

Called the Neural Simulation Tool, or NEST for short, the highly scalable software—now in its third iteration (NEST 3) – helps neuroscientists explore the dynamics, size and structure of entire neural networks. NEST 3 can be used on networks of all sizes: information processing models (applicable to the visual or auditory cortex of mammals), models of network activity dynamics (e.g. laminar cortical networks or balanced random networks), and models of learning and plasticity.

NEST 3 caters to different users—from laptop-using student researchers to established scientists working on supercomputers—and even scales to exascale computers of the future. "NEST is the leading tool for neuronal network simulation focusing on network dynamics and a reference tool in its field," notes Prof. Hans Ekkehard Plesser of HBP SGA3 project partner Norwegian University of Life Sciences in a news item posted on the Human Brain Project website. "The combination of the NEST 3 simulator, NESTML modeling language and the NEST Desktop user interface provide a powerful combination of tools for cutting edge neuroscience and education," continues Prof. Plesser, who is also president of the NEST Initiative and leads the EBRAINS High-Level Support Team.

By making it easier to build intricate network models, NEST 3 helps brain scientists be more productive. "Using NEST 3 a single line of code can achieve what required dozens of lines of code in earlier versions. This allows researchers to explore a wide range of model variants and makes it easier to validate models, contributing reliable and reproducible research," the news item reports.

NESTML and the NEST Desktop

The NESTML modeling language makes writing custom neuron models and creating efficient code a simple matter. The powerful and user-friendly domain-specific language therefore makes it possible for scientists to effortlessly extend NEST with new models of nerve cells and their connections. This improves research quality and makes sharing new models with other scientists easier.

The NEST Desktop web-based application bypasses the need to learn a programming language to be able to use the NEST 3 simulator, while still teaching users how to construct and explore neuronal networks. According to the news item, NEST Desktop was "conceived and trialed as a teaching tool" at HBP SGA3 (Human Brain Project Specific Grant Agreement 3) project partner University of Freiburg. It "has matured to production use through a Human Brain Project partnering project and is now available as an online tool on EBRAINS."

More information: Human Brain Project website: www.humanbrainproject.eu/en/

Provided by CORDIS

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