Technology

Controlling computers just by thinking

OpenBCI

Neurotechnology pioneer OpenBCI uses powerful Lenovo ThinkStation workstations to support the development of Galea—a groundbreaking biosensing headset designed to interface with the human mind.

Lenovo

1

Who is
OpenBCI?

OpenBCI stands for open-source brain-computer interface (BCI). For over a decade, OpenBCI has led the world in developing hardware and software for accessible neurotechnology. The company creates open-source tools for biosensing and neuroscience, so anyone with a computer can sample physiological data from their body. OpenBCI's mission is to lower the barrier to entry for BCI, while ensuring that these technologies are adopted into the consumer landscape in an ethical way that protects user agency and mental health.

OpenBCI

2

The
Challenge

Galea, OpenBCI's latest product, is a multi-modal biosensing headset that unites spatial computing, AI, and wearable neurotechnology, designed to interface with the human mind. It combines high-fidelity AR/VR/XR display technology with the most comprehensive bio-sensing headwear ever made commercially available. In fact, Galea is the world's first device that integrates EEG, EMG, EDA, PPG, and eye-tracking into a single headset to simultaneously measure the wearer's heart, skin, muscles, eyes, and brain.

By combining a multi-modal sensor system with the immersion of AR/VR/XR, Galea gives researchers and developers a powerful new tool for understanding the human mind and body, as well as creating solutions that respond to it.

With all its sensors, Galea generates truly vast amounts of data. To analyze all this data in real time, and to develop, train, and fine-tune its AI models as quickly and as efficiently as possible, OpenBCI needs high-performance hardware capable of handling demanding AI workloads.

"Ultimately, I see the combination of neurotechnology and AR/VR as the future of personal computers. Spatial computing, BCI, and AI will converge this decade, resulting in quite possibly the greatest technological inflection point humanity has ever experienced. It is going to be remarkable."

Conor Russomanno
Founder & CEO, OpenBCI

Powering AI

Today, OpenBCI uses powerful Lenovo ThinkStation workstations to collect, analyze, and process data, helping to move Galea and its other projects forward more quickly.

Powered by AMD Ryzen Threadripper Pro CPUs and ultra-high-end NVIDIA RTX GPUs, the Lenovo ThinkStation P620 workstation delivers game-changing performance. The highest-performing heterogeneous workstation in its class, it makes light work of compute and graphics-intensive AI workloads.

Hardware
Lenovo ThinkStation P620 workstation

Software
Lenovo Device Intelligence
Lenovo Performance Tuner
Lenovo Workstation Diagnostics

"AI and brain-computer interfacing has always had a symbiotic relationship. Our understanding of the mind has led to breakthroughs in AI, like reinforcement learning and neural networks. AI is a key piece in OpenBCI's effort to turn the ocean of physiological data into meaningful insights."

Joseph Artuso
President & CCO, OpenBCI

3

Results

By giving the data scientists training AI models the speed and flexibility to iterate faster, the Lenovo ThinkStation workstations are helping OpenBCI to shorten innovation cycles. This has significantly increased its agility during the development of Galea, which is already producing amazing results.

These results include the NeuroFly Project. OpenBCI worked with Christian Bayerlein, a German technologist and disability rights activist living with spinal muscular atrophy (SMA), a genetic disease that affects the motor neurons that control voluntary muscle movement. During TED2023, Christian and OpenBCI Founder & CEO Conor Russomanno demonstrated how residual muscle activity from Christian's body could be channeled to pilot a drone.

"None of this would have been possible without our partnership with the Lenovo team and the support from their workstations group that allowed us to iterate quickly," says Joseph Artuso, President & CCO at OpenBCI.

To learn more about the inspiration behind the NeuroFly Project, as well as all the work that went into flying a drone with the mind, you can watch OpenBCI's documentary on the project here.

✓ Accelerates AI workloads

✓ Shortens innovation cycles

✓ Drives pioneering R&D

Taking flight

As part of the NeuroFly project, OpenBCI worked with Christian to identify the four muscle groups that he could most reliably activate and placed electrodes on these muscles. OpenBCI's hardware and software were used to translate each muscle's activation into digital sliders that Christian learned to control. Signal processing and fine-tuned filtering helped eliminate false-positives and enable the thresholds of the joystick to adapt specifically to Christian and to variations across sessions. These sliders were then mapped to a new digital joystick. With practice, Christian was able to learn how to use the new controls to gain full control over the drone. By connecting the drone's camera to a Varjo Aero VR headset, Christian was able to fly in first person over the TED audience.

"Flying a drone has always been a dream of mine," said Christian. "I see it as a way to experience a sense of freedom and independence that is often limited by my disability. I've always been fascinated by aviation and the feeling of soaring through the air, and being able to pilot a drone using my brain signals was an incredible experience that I will never forget."

The NeuroFly project is made possible through resources and expertise donated by Lenovo, Formlabs, and Varjo. The NeuroFly toolkit will be released free as open-source software so that others can use it as a starting point for their own projects.

Looking to the future

While Galea holds promise for therapies and remedies for people with a broad range of physical impairments, there are many more possible applications of the technology. In fact, the Galea Beta program has drawn significant interest from innovation teams across gaming, entertainment, aviation, simulation and training, and human factors engineering for automotive and other industrial applications.

"Feedback from our early partners has been instrumental in the development of Galea Beta," says Joseph Artuso. "The common theme across our early adopters is a desire to use Galea's sensor data to help quantify otherwise qualitative mental experiences."

Galea headset

"AI and wearable brain-computer interfacing will define the next generation of computers. Lenovo workstations are helping us to build that future at OpenBCI."

Joseph Artuso
President & CCO, OpenBCI

Why **Lenovo**?

For OpenBCI, the Lenovo ThinkStation P620 offered the ideal platform for its development workloads, delivering immense CPU and GPU performance to support everything from model training to machine learning to inferencing with speed and efficiency.

But the partnership is about more than just hardware, as Eva Esteban, Embedded Software Engineer at OpenBCI, explains: "Having the support and expertise of a global technology leader such as Lenovo is invaluable for a startup like ours. It helps our engineering team to iterate fast and build reliable solutions that cater to the diverse needs of all users."

How can you turn science fiction into science fact?

OpenBCI accelerates AI workloads and shortens innovation cycles with powerful Lenovo ThinkStation workstations.

Explore Lenovo Workstations for AI

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