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Neurotechnology & Privacy: The Battle for Your Brain Is Here

By Jared Genser

A mind-controlled robotic exoskeleton made it possible for a paraplegic man to kick off the 2014 World Cup in Brazil, and an AI-based steering system for a quadriplegic former IndyCar driver to race again in 2021.

As scientific innovations have revolutionized our understanding of the human brain, they have also opened up enormous possibilities for economic development — and the potential for abuse of highly personal information. Some states have started to take action. Colorado became the first to update its privacy laws in April 2024 to include neural data in the definition of "sensitive data," followed by California in September.

Other states and nations are moving new laws forward, and the United Nations, the Organization of American States, and the Organization for Economic Co-operation and Development, among others, have produced guiding recommendations. But these kinds of efforts need to be accelerated because the future is already here.

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POWER OF EMERGING NEUROTECHNOLOGIES

The most common implantable neurotechnologies include deep brain stimulation, which uses electrical impulses to treat medical conditions like Parkinson's disease, and cochlear implants, which are electronic devices placed in the inner ear to help people who are deaf or hard of hearing to understand sound.

In 2023, using an implanted brain-computer interface powered by generative artificial intelligence, a paralyzed woman was able to speak again for the first time since her stroke 18 years earlier. The technology decoded her inner language at 80 words per minute and projected her emotions and basic intended facial muscle movements onto a digital avatar.

Aside from wearable devices, there is now a wide array of neurotechnology products for tracking stress and energy, attention level, mood, and meditative states, among others. Some devices combine neurotechnology and gaming, such as a product that lets you fly a small helicopter drone with your mind. Then there's Apple's pending patent for biosensors to monitor brain activity for its next-generation AirPods.

As use of these devices continues to grow rapidly, legal and ethical concerns are also rising. For example, China halted trial of a head-mounted device from U.S. company BrainCo to monitor schoolchildren's level of concentration. According to local media reports, parents widely voiced their concerns about privacy and fears that the technology could be used to control the children.

Workplace surveillance of employees through the deployment of neurotechnologies is also expanding. When used well, such devices can improve workplace productivity and safety. For example, SmartCap's fatigue-tracking headband has been used by long-haul trucking companies in the United States. With its built-in electroencephalogram (EEG) sensors, the headband can detect if a driver is tired, alerting both the worker and their supervisor. But because these kinds of devices gather and decode medical-grade neural data, they could also give employers access to additional information about their employees, such as evidence of early cognitive decline, that could result in discrimination.

NEURORIGHTS: A FRAMEWORK FOR ANALYSIS

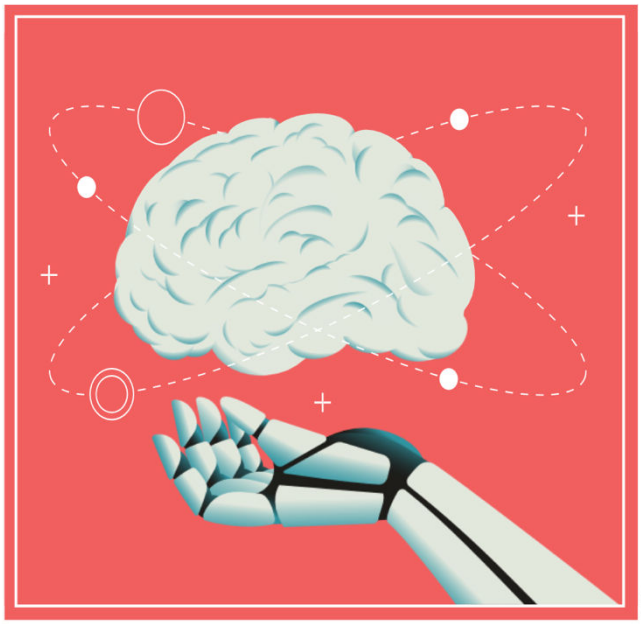
The pace of innovation has underscored the need for guardrails in the form of international, national, and state laws, principles, and policies, as well as technological safeguards to protect people from the misuse or abuse of neurotechnologies.

In 2017 Dr. Rafael Yuste, a professor of biological sciences at Columbia University and chair of the Neurorights Foundation, convened a group of researchers, clinicians, engineers, and bioethicists called the Morningside Group. In a peer-reviewed article published in *Nature* that same year, they observed that advances in neurotechnologies could "revolutionize the treatment of many conditions, from brain injury and paralysis to epilepsy and schizophrenia, and transform human experience for the better." However, they cautioned that "the technology could also exacerbate social inequalities and offer corporations, hackers, governments or anyone else new ways to exploit and manipulate people" and "profoundly alter some core human characteristics."

The group proposed the adoption of five "neurorights" to protect the brain, extending rights that are already partially protected or that can be further interpreted from existing international and domestic law. They include (1) the right to identity or the ability to protect

one's mental integrity, (2) the right to agency or freedom of thought and free will, (3) the right to mental privacy and to protect the inner workings of one's brain from disclosure, (4) the right to fair access to mental augmentation, and (5) the right to nondiscrimination in the development and application of neurotechnologies.

Guaranteeing just the right to mental privacy, as a start, will be a challenging road full of complexity. While implantable neurotechnologies, such as those being developed by Elon Musk's Neuralink, are regulated as medical devices, and the data collected by companies is protected under HIPAA and state health privacy laws, the market for wearable neurotechnologies is growing quickly. These devices are considered consumer electronics without any protections. This is a major concern because wearable devices all employ medical-grade technology, mostly EEG scanners, that can capture gigabytes to terabytes of neural data per user, and only a small fraction of which is used for the product's purpose. Used in a medical setting, they would have to be licensed by the U.S. Food and Drug Administration.



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Neural circuits in the brain create our thoughts, emotions, and memories; guide decision-making; and form our personality, identity, sense of self, and even our subconscious. This means that the medical-grade neural data being collected and analyzed by consumer neurotechnologies can reveal deeply intimate information well beyond the intended use of these products, such as certain medical conditions and mental or emotional states. Therefore, the lack of a federal consumer data privacy law presents a problem. And although approximately 20 states have developed their own laws, they generally only protect personal and sensitive information such as geolocation, genetic, and biometric data, not neural data.

As one illustration of what is coming, researchers in Australia decoded thoughts to text at 40 percent accuracy using wearable EEG helmets combined with generative AI. As this device and others like it are perfected, there is every reason to expect that within a few years, we will be sending text messages decoded from our inner language.

Most people who buy consumer neurotechnology products are not fully aware of the sensitivity and amount of information they are giving away. In a study published in April 2024 and covered on the front page of the *New York Times*, the Neurorights Foundation concluded, after analyzing the user agreements of 30 consumer neurotechnology products and the rights provided by companies, that the agreements fall far short of a half-dozen different global privacy standards. For example, all but one of the companies can access users' neural data and transfer it to third parties. In addition, only 12 companies allow users both to stop the companies from processing their data and to request that their data be deleted, and only three say they seek to deidentify users' data, encrypt it, and notify users in the event of a security breach. The Neurorights Foundation is now working with several companies to develop a model user agreement that could be adopted by neurotechnology companies to fully meet global standards.

IMPACT ON LAWYERS AND THE LAW

Beyond regulating neurotechnologies to address possible misuse or abuse, forthcoming developments may have an enormous effect on how lawyers conduct their work.

Consider the potential impact of neurotechnologies on criminal law and tort law. With cutting-edge devices such as the Kernel Flow brain imaging headset, which is approaching the quality of a magnetic resonance imaging machine but in a helmet, the development of a (virtually) unbeatable lie detector may be imminent. In Werner Herzog's documentary *Theatre of Thought*, the device showed visibly and dramatically different brain scans of a single person lying and telling the truth about the answer to a simple math problem. Imagine if criminal suspects could be regularly exonerated by agreeing to be questioned wearing such a device. But, as an unintended consequence of the deployment of such technology, juries might also be much more inclined to convict criminal defendants who do not choose that option.

Neurotechnologies could also eventually become a major tool in assessing a defendant's mental capacity. Research today, for example, can already show if an individual has a param-

eter that is typical of someone with impaired capacity, although that doesn't necessarily mean they lack capacity. In the future, neurotechnologies may also help assess if a criminal defendant has the *mens rea* or mental state required to convict them of a crime.

In a 2017 study published in the peer-reviewed *Proceedings of the National Academy of Sciences*, researchers investigated whether or not brain activity alone could detect the difference between the mental states of "knowing" and "reckless." Combining functional magnetic resonance imaging with AI, they found "evidence strongly supporting the existence of a brain-based distinction between knowing and reckless mental states."

We are just starting to see brain scans coming from neurotechnologies being used as expert evidence in civil cases, but there is every reason to believe this will become much more sophisticated and widely used in the coming years. For example, brain imaging could be used to show that a plaintiff who appears physically uninjured after an accident is actually experiencing chronic pain from misfiring neurons in their brain. Neuroimaging could be used to demonstrate the extent of brain damage after a medical procedure, or prove a person is in severe emotional distress. And in a product liability case where there are allegations that the defendant's product caused cognitive impairments, the link between that exposure and changes in brain function could be shown by neuroimaging as well.

Also consider how lawyers could use emerging neurotechnologies for their own mental augmentation. A study by a team at Boston University showed that sending electrical currents into two parts of the brain known for storing and recalling information boosted short-term memory in adults over 65 for more than a month. In another study from the University of Sydney, the use of transcranial direct current stimulation helped 40 percent of participants solve a complex mathematical puzzle, as compared to none in the control group. And numerous other studies have found that real-time use of EEG scans can help assess and maximize the outcome of cognitive training where students repeatedly perform cognitive tasks to improve their abilities.

These technologies will be perfected in the coming years and ultimately made widely available. Imagine if you could augment your cognitive abilities to proceed more quickly and effectively in your legal work. Would your failure to augment your abilities lead to a professional negligence action if you made an error? And how would law school education and preparation for the practice of law be impacted by disparities between law students who could afford mental augmentation during their studies and those who could not?

THE LAW WILL NEED TO EVOLVE TO ADDRESS SERIOUS HUMAN RIGHTS ISSUES RAISED BY THESE DEVELOPMENTS, SUCH AS HOW NEUROTECHNOLOGIES MAY FACILITATE INTRUSIONS INTO PRIVACY, SUPERCHARGE SURVEILLANCE, AND IMPACT PEOPLE'S FEELINGS AND BEHAVIORS.

THE WAY FORWARD

Given the importance of the law in shaping society, the role of lawyers will be key in striking the right balance between supporting innovation in the development and application of neurotechnologies and managing the downside risks of their misuse and abuse. The law will need to evolve to address serious human rights issues raised by these developments, such as how neurotechnologies may facilitate intrusions into privacy, supercharge surveillance, and impact people's feelings and behaviors, even without their knowledge. And the law will also need to develop solutions addressing fair access to augmentation, algorithmic bias, and device safety.

More practically, there are three specific things that could be done to advance efforts in the United States on these issues. First, President Donald Trump could direct, after expert consultation, the White House Office of Science and Technology Policy to review and report on global and national efforts underway to regulate emerging neurotechnologies with an aim of developing a set of principles and practices to help guide their design, use, and deployment.

Second, the U.S. Congress could protect the mental privacy of Americans who use consumer neurotechnology products. In the last Congress, a much broader bipartisan consumer data privacy bill called the American Privacy Rights Act was proposed, incorporating protections for neural data, but that bill was never adopted.

Third, the D.C. Bar has an especially important role to play given both its size and influence. As a start, it could convene a summit on emerging neurotechnologies like the one it organized to discuss the expected impacts — both positive and negative — of AI and chatbots on the legal profession.

The world is on the cusp of a neurotechnology revolution. But this isn't something to worry about later. The future is already here.

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