Emerging Neuralink Brain Machine Interface Technology: An Oversight Proposal to Address the Ethical, Legal, and Social Implications

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Background

The Neuralink device is an invasive brain-implant that will function as a brain machine interface (BMI) and consists of an array of 96 flexible polymer probes possessing up to 3072 electrode channels, see Fig. 1a-c. Neuralink has developed a neurosurgical robot which inserts 6 polymer probes, 192 electrodes, per minute with micron precision in order to prevent damage to surface microvasculature and to target specific cortical areas of the brain. In rat models, the company implanted BMI achieved up to 70% spiking yield, which means that digitized broadband signals from the probes were effective at identifying action potentials in real time, see Fig. 1c(10).

Future Applications

Neuralink has submitted for Food and Drug Administration (FDA) approval with the intent to begin testing technologies on human patients within the next year. Neuralink aims for the installation of its BMI to become “safe and easy as LASIK eye surgery”(14).

Neuralink in the Legal System

• The Frye standard permits the use of “scientific, technical, or other specialized knowledge” in a legal court so long as it is a qualified expert to testify on the reliability of such evidence and that the evidence produced is from a modality generally accepted by the relevant scientific community(11). Federal Courts use the Merril Dow standard for admissibility of evidence, which provides Judges wider latitude in accepting scientific evidence. It could be argued that application of brain data such as mental state may be held admissible in a court of law and could be a further concern of defendants, enhance witness testimony or exonerate wrongfully convicted inmates, similar to how DNA evidence is used within the legal system and forensics (11)(15).

Concerns

• The procurement of brain data may pose a legal or ethical dilemma, considering that U.S. citizens may or may not be protected from unreasonable searches and seizures or from inimical practices by the Fourth Amendment(16). For these reasons there should be a committee that contains scientific experts which may be called upon to evaluate the reliability of brain data, as well as ethics and law experts, who would provide insight into the constitutionality of acquiring and utilizing brain data.

Privacy and Cybersecurity

Neuralink’s BMI device will potentially permit recording of neural data and neural surveillance, which with the advancement of computer algorithms may in the future be used to decode existing or write new memories, among other possible cognitive enhancements(6). This may be possible once neuroscience advances to a point in which the complex circuitry of short and long term memory has been mapped.

Neuralink

• It is speculated that the BMI electrodes will eventually permit recording of neural data and technology, particularly due to its anticipated human trials and access to user brain data.

Neuronal data collection and management will enhance “syntomic with artificial intelligence” via future iterations of its BMI technology(9)(10).

• It is also important to use this early data prior to product debut, delineating whether Neuralink may be mandated to disclose private brain data. The company 23andme serves as an example of unintended consequences of there not being clear laws on similar technology.

Oversight Proposal

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There are currently no federal laws in the United States protecting personal brain data. The committee can coordinate with similar organizations such as the Australian Brain Alliance (ABA). The ABA’s mission is to develop “national guidelines for responsible neuroinnovation to assist neuroscientists, engineers, and developers to translate research into innovative and effective products” and to “mitigate potential ethical, legal, and social risks of BMI technology“.

What is Neuralink?

Neuralink is a neurotechnology company focused on brain-machine interface technology, with the goal of advancing brain machine technologies.

References

4. Perper, R. (2019, July 17). Elon Musk’s company Neuralink plans to connect people’s brains to the internet by next year using a procedure he claims will be as safe and easy as LASIK eye surgery. Retrieved from https://www.businessinsider.com/snowden-leaks-timeline-2016-
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