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Network Neuromodulation

A closed-loop deep brain stimulation device that exploits new mechanisms of action to control brain networks

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IP Status: Provisional Patent Applications Filed; **Application #:** 63/107,274; 63/141,633; 63/141,628

Applications

- Medical device - deep brain stimulation

Key Benefits & Differentiators

- Delivery of stimulation is timed with respect to the native neural activity to induce desired response (increased/decreased network communication)
- Rapid path to first-in-human by leveraging commercially available electrodes and other non-innovative components
- Form factor, materials, and surgical tooling identical to devices currently on the market; only the energy delivery is different
- Designed by active clinicians to solve known pain points
- Platform technology with wide utility across many diseases

Overview

Current neuromodulation therapeutic devices are designed to stimulate a single brain target, largely in an open-loop fashion. They cannot produce targeted change in specific sub-circuits/networks. This limits their efficacy in disorders beyond the current applications (mainly tremor and seizure disorders). Specifically, current devices cannot address mood, anxiety, or cognitive disorders, and have failed RCTs in those spaces.

Researchers at the University of Minnesota have developed a novel closed-loop and deep brain stimulation system that can directly read out and alter the connectivity of specified brain networks. The key has been the development of novel approaches to lock stimulation pulses to ongoing brain activity, especially to the phase (rise and fall) of ongoing electrical brain rhythms. When this precisely time-locked stimulation is given, network communication changes. Those changes can last for hours after the stimulation stops. Communication between individual brain areas can be increased or decreased, and specific electrical frequencies (communication channels) can be targeted. In between stimulation pulses, the system contains specialized signal processing circuitry to measure brain network connectivity in real time, and to predict a patient's behavioral state based on that network activity. Efficient machine learning classifiers are built directly into the circuitry. These capabilities are impossible even with advanced "sensing DBS" systems on the market -- they depend on specialized hardware that makes complex mathematical operations highly efficient. We can thus leverage novel mechanisms of action that are unavailable to competitors.

Phase of Development

TRL: 3-4
Initial prototypes in development

Desired Partnerships

This technology is now available for:

- License
- Sponsored research
- Co-development

Please contact our office to share your business' needs and learn more.

Researchers

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