Clinically-Oriented Optimization in Distributed Training for Fully Embedded aDBS

This technology offers a training procedure that permits a reliable collection of training data and a supervised machine learning algorithm for personalized clinical training and adaptive deep brain stimulation classifiers.

What is the Problem?

Most previously investigated adaptive deep brain stimulation systems have made use of either external feedback methods or distributed data processing structures. However, each of these system architectures entail significant drawbacks. External feedback systems require a patient to wear some symptom-tracking device at virtually all times, which is unlikely to serve in a translational capacity due to the likelihood of patients forgetting the required device some days or even their unwillingness to wear it altogether. Likewise, distributed systems tether patients to an associated data processing device, limiting mobility in cases where the tether is a physical wire and, with wireless systems, running into the same problems encountered with wearables. A clear solution to these concerns is a fully implanted system, in which internally detected biomarkers are processed in the implantable pulse generator itself and an on-board algorithm applied to modulate stimulation parameters in real time. However, due to the necessity of using only internally recorded data and the limited processing power available on implanted devices relative to modern mobile devices, these systems would lack the ease of interpretability in programming ensured by wearable systems and the sheer processing power available to distributed systems. This has previously limited the translational applicability of fully implanted adaptive deep brain stimulation.

What is the Solution?

The solution is a distributed training procedure permitting reliable collection of training data and a supervised machine learning algorithm optimized for clinical considerations to train intrinsically personalized adaptive deep brain stimulation classifiers. These classifiers are then uploaded to the patients' devices and their performance evaluated through internal measurement unit data analysis and patient feedback.

What Differentiates it from Solutions Available Today?

Existing solutions for adaptive deep brain stimulation systems suffer from numerous drawbacks. These include requiring the patient to wear a symptom-tracking device, which can

Technology ID

BDP 8697

Category

Device/Other

Selection of Available Technologies

Authors

Andrew Herron

Learn more

lead to compliance issues and can limit mobility. Issues with implantable systems include power and processing power issues that are inherent with implantable systems. This system greatly simplifies the training procedure itself while simultaneously increasing reliability and transparency of classifier training.

Patent Information:

US20220401736A1

References

1. Sebastián Castaño-Candamil, Benjamin I. Ferleger, Andrew Haddock, Sarah S. Cooper, Jeffrey Herron, Andrew Ko, Howard. J. Chizeck, and Michael Tangermann(44136) , https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7674800/, Frontiers in Neuroscience