Application for APTA of MA Continuing Education Courses

Applicant:
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1. **Title:**

Neural Interfaces for Restoring Communication and Mobility

2. **Course Description**

For people with cervical spinal cord injury, pontine stroke, neuromuscular disease including amyotrophic lateral sclerosis, and other neurologic illnesses, currently available assistive and rehabilitation technologies are inadequate. In severe brainstem stroke and advanced ALS, patients may suddenly or progressively enter a locked-in state of being awake and alert but unable to move or communicate. Through clinical translation based on decades of fundamental neuroscience research, intracortically-based “brain-computer interfaces” are poised to revolutionize our ability to restore lost communication and mobility. Over the past decade, neurotechnologies to record the individual and simultaneous activities (action potentials, multi-unit activity, and local field potentials) of dozens to hundreds of cortical neurons have yielded new understandings of cortical function in movement, vision, cognition, and memory. This preclinical research, generally performed with healthy, neurologically intact non-human primates, has demonstrated that direct neural control of virtual and physical devices can be achieved. Recently, this exciting research has been translated into initial pilot clinical trials (IDE) of an intracortically-based neural interface system (BrainGate), seeking to determine the feasibility of persons with tetraplegia controlling a computer cursor or other devices simply by imagining movement of their own hand. A variety of methods for decoding brain signals are now being tested with the hope of not only restoring communication, but also providing a control signal for the reanimation of paralyzed limbs. In related research, intracortical recording technologies are providing early glimpses into the activities of dozens of individual cortical neurons during intracranial seizure monitoring, with the potential to provide new diagnostic and therapeutic modalities for people with epilepsy.

3. **Course Learning Objectives:**

- The learner will be more familiar with brain-computer interfaces
-The learner will be aware of ongoing trials of intracortically-based brain-computer interfaces for people with paralysis

4. **Instructional Level:** Basic

5. **Instructional Format:** Lecture

6. **Current References:**


(2) Truccolo W., *et al.* Primary motor cortex tuning to intended movement kinematics in humans with tetraplegia. Journal of Neuroscience, 2008; 28(5);1163-1178.

(3) Simeral, J.D. *et al.* Neural control of cursor trajectory and click by a human with tetraplegia 1000 days after implant of an intracortical microelectrode array. J. Neural Engin. 2011; 8(2) 02027.


7. **Curriculum vitae** (see attached)