MEng Design Project Announcement – 2018-19 AY

Project title:
Studying the EEG signatures of tactile stimulation for brain-computer interfaces based on sensory stimulation

Brief Description of Design Project Goals:

Overview:
A brain-computer interface (BCI) provides a non-muscular channel for interaction with the external environment. By measuring the EEG signals from sensory cortex and extracting relevant biomarkers, a subject’s somatosensory attention can be decoded by state-of-the-art machine learning algorithms. Features related to the sensory cortex activity play an important role in the tactile BCI system. The goal of this project is to develop a BCI system based on sensory stimulation. To better facilitate the decoding of subjective somatosensory attention, the effect of sensory stimulation will be thoroughly investigated, with respect to different body parts (hand, foot), stimulation depths (tactile, proprioceptive), waveform parameters (amplitude, frequency, frequency or amplitude modulation), and its EEG dynamics across spatial-spectral-temporal space.

Specific MEng Contribution: The MEng students will design a tactile stimulation system to stimulate the fingers and wrist skin, and will set up a system that can control the vibration pattern and communicate with a computer. After designing the hardware, students will investigate the EEG signatures of different stimulation patterns and perform the subsequent EEG analysis. Finally, students will integrate the optimal stimulation pattern into a tactile BCI system.

ECE Field Advisor Name: Mahsa Shoaran
- Email – shoaran@cornell.edu
- Phone – 607-255-3974
- Office – 428D Phillips Hall

Project Web Site: http://cnl.ece.cornell.edu/

Number of MEng Students Needed: 2

Required Skills: Experience with PCB and system design, Arduino programming and MATLAB, knowledge of signal processing

Estimated Project Time Frame: 2018-19 Academic Year, Two (2) Semesters