Washington University in St. Louis

Engineering

Preston M. Green Department of Electrical & Systems Engineering

Seminar Announcement

Brandon Westover

Harvard Medical School /
Massachusetts General Hospital
Boston, Massachusetts

Monday, October 12, 2015
Green Hall, Room 0120
1:10 PM

Burst Suppression EEG Patterns: Towards Robust Closed-Loop Control of Anesthesia for Refractory Status Epilepticus

Abstract: Burst suppression is an electrical state of the brain state characterized by intermittent periods of diffuse voltage suppression in the electroencephalogram (EEG). Burst suppression can arise spontaneously from anoxic brain injury and certain cerebral developmental disorders; or can be induced therapeutically by hypothermia during cardiac surgery with complete interruption of blood flow or by anesthetic drugs used to terminate intractable seizures. Despite its clinical importance, in clinical practice the monitoring and management of burst suppression is largely ad hoc and relies on clinical judgment unaided by technology.

This talk will present recent progress towards understanding, quantifying, and controlling burst suppression. I will review three main lines of research: 1) modeling work showing how key features of burst suppression can be viewed as arising from a fast-slow dynamical system under feedback control by metabolic processes; 2) work to develop model-based probabilistic inference algorithms that couple pharmacokinetic / pharmacodynamic (PKPD) models for anesthetic action with observable EEG data to monitor the depth of burst suppression in real time; 3) work towards developing a robust feedback control system, capable of maintaining target levels of burst suppression in patients with refractory seizures in ICU settings that include high levels of noise and missing data, PKPD uncertainty, and environmental disturbances.

Bio: Dr. M. Brandon Westover, MD, PhD, completed medical training and a PhD degree in physics at Washington University School of Medicine in St. Louis. He is a board certified practicing neurologist, specializing in epilepsy and clinical neurophysiology at Harvard Medical School / Massachusetts General Hospital (MGH), where he directs the MGH Critical Care EEG Monitoring Service. Dr. Westover is a leader in clinical applications of electroencephalography (EEG) to the care of patients with acute neurological conditions such as delirium, anoxic brain injury, status epilepticus, and delayed cerebral ischemia. His research efforts include developing automated methods for interpreting clinical EEG data, closed-loop control of sedation and analgesia, biomedical informatics, probabilistic medical decision modeling, and the neurophysiology of pain, sedation, and delirium in critically ill patients. Dr. Westover's research seeks to develop innovative applications of engineering and computation to improve medical care for patients with acute neurological illnesses.

Host: Dr.ShiNung Ching