EEL 6935 BRAIN MACHINE INTERFACES
Fall 2013

Instructor: Jose Principe
Office: EB 451
Phone: 352-392-2662
Email: principe@cnel.ufl.edu
Office Hours: TBA

Pre-Requisites: Foundations of Signal Processing and basic knowledge of statistical signal processing.


References: Recent papers will be made available in the course website

Course Goals:
The goal is to present an overview of the recent field of Brain Machine Interfaces and neurotechnology with an emphasis on the engineering aspects of the problem (signal processing, and neurotechnology). The student will have the opportunity to work with brain signals and develop and test algorithms for BMIs.

Topics:
A brief introduction to neurophysiology will be provided to allow engineers to develop new methodologies in tune with the reality of the central nervous system. The major topics will cover neurophysiology and models, hierarchical brain organization, and neural signal collection. We will review different types of brain machine interfaces, their architectures, and devote most of the course to the development of algorithms to extract and quantify neural activity with multielectrode arrays. We will cover both non invasive and invasive techniques. In terms of models we will start with the Wiener filter, and present nonlinear models based on neural networks. We will cover generative models for BMIs such as the Kalman filter and Bayesian methods, and time permitting, will also address the challenges of developing spike train signal processing methods.

Grading: Homework 30%
Project I 35%
Project II 35%

Computer Projects:
Several applications (EEG, ECoG, spike trains) will be outlined. During the course students will have the opportunity to program adaptive algorithms in MATLAB and test them in real world data.