Course Announcement

The Department of Electrical and Computer Engineering Santa Clara University

COURSE  SPECIFI

ELEN 239A: (Topics in Systems Theory) Intro to Brain Computer Interface (2 units)

Instructor Name: Dr. Gautam Krishna

Quarter and Year (Fall 2023)

Class Time (M 7:10 - 9:00 pm)

This in an entry level introduction to BCI. It will include methods for direct interaction between the human neural system and machines to augment human capabilities, especially for people with disabilities, with emphasis on signal processing applied to electroencephalogram (EEG) signals, recording of different brain signals, and interaction paradigms which decode and exploit them. The application ML methods to design complex brain-controlled devices will be introduced.

Course outline:

Introduction: Non-invasive and Invasive BCI and applications
EEG measurements and information models
Python MNE and MATLAB EEG toolbox
EEG preprocessing methods
Methods for removal of EEG artifacts
Event related potential – neural activity related to sensory and cognitive processes
Time Frequency analysis
Statistics and multivariate analysis
Introduction to Machine learning EEG decoders
Designing EEG experiments

Learning Outcomes: Students will be able to

Use Python MNE or EEG Lab to analyze EEG data sets
Design basic end-to-end BCI system

Prerequisite skills / knowledge (Optional):

Basic signal processing at the level of ELEN 233 or COEN 201
Introductory knowledge of machine learning at the level of ELEN 520 or equivalent
Programming in either Python or MATLAB

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