Translating EEG Brainwaves Into Distinct Features

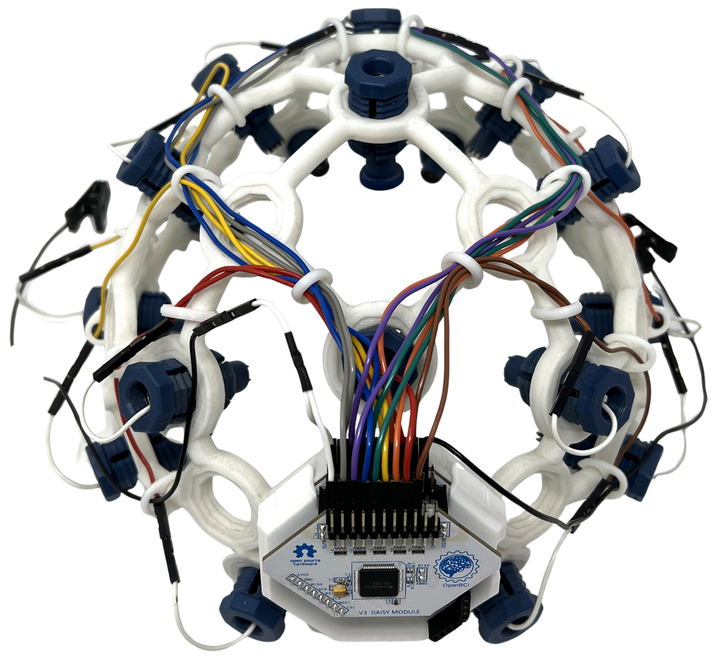
Nam Dang
hieunam.dang@concordiahanoi.org
Machine Learning Class 2025-26
(Dr. Santos)

CONCORDIA
INTERNATIONAL SCHOOL HANOI

Github Project

Project Goals

Record, process, and directly analyze EEG data to then predict the current state of the mind (or distinct actions thought)



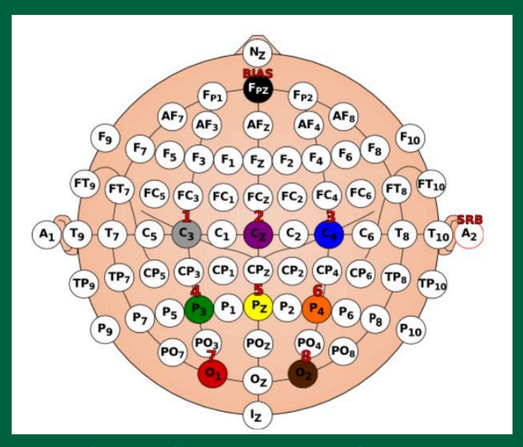
Components

- Hardware: OpenBCI's Ultracortex Mk4 (Cyton)
- Software: OpenBCI GUI, Python (Brainflow)

Workflow

Data Collection

Electrode locations (10-20 rule)



Checks impedance

30 x n distinct features trials:
2 sec preparation;
4 sec capturing data;
(via stimulus on-screen)
1.5 sec rest time.

Preprocessing & Extraction

translate raw data into:
Detrend
Bandpass
Bandstop

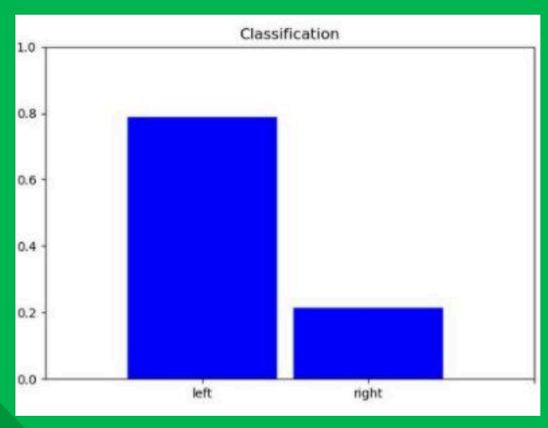
Remove Environmental Noise (Artifacts)
PSD (power spectrum domain)
EEG bands (alpha, beta, theta, delta, gamma)

Model Creation & Training

Random Forest
Gradient Boosting
SVM
Logistic Regression

Can select individual or a general model based on amount of data trained
Uses 4 methods and picks the most accruate

Prediction



Directly intakes EEG data and uses selected model to predict actions in real-time

Shows confidence rating

Challenges

EEG impedance can heavily impact the quality of data collection and real-time prediction (especiialy for people with different hairs and heads).

Future Work

Add a method so that the algorithm is a feedback loop, or in other words, live prediction can also be used as data to train and create models through correcting errors found in the testing phase.

CIRCH
CONCORDIA INTERNATIONAL RESEARCH CONFERENCE HANOI