

GROUP-25

Members:

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GitHub Link : https://github.com/AkashKulkarni4444/BCI_Project

Description of Dataset and Experiment:

Experimental Protocol

Introduction

Subjects performed different motor/imagery tasks while 64-channel EEG were recorded using the BCI2000 system ([BCI2000 website](http://www.bci2000.org)).

Experimental Runs

Each subject performed 14 experimental runs:

1. Two one-minute baseline runs:
 - Baseline with eyes open
 - Baseline with eyes closed
2. Three two-minute runs of each of the following tasks:
 1. Task 1: Open and close left or right fist
 2. Task 2: Imagine opening and closing left or right fist
 3. Task 3: Open and close both fists or both feet
 4. Task 4: Imagine opening and closing both fists or both feet

Summary of Experimental Runs

1. Baseline, eyes open
2. Baseline, eyes closed
3. Task 1 (open and close left or right fist)
4. Task 2 (imagine opening and closing left or right fist)
5. Task 3 (open and close both fists or both feet)
6. Task 4 (imagine opening and closing both fists or both feet)
7. Task 1
8. Task 2
9. Task 3
10. Task 4
11. Task 1
12. Task 2
13. Task 3
14. Task 4

Data Format

The data are provided in EDF+ format, containing:

- 64 EEG signals
- Sampled at 160 samples per second
- Annotation channel

Annotations

Each annotation includes one of three codes (`T0`, `T1`, or `T2`):

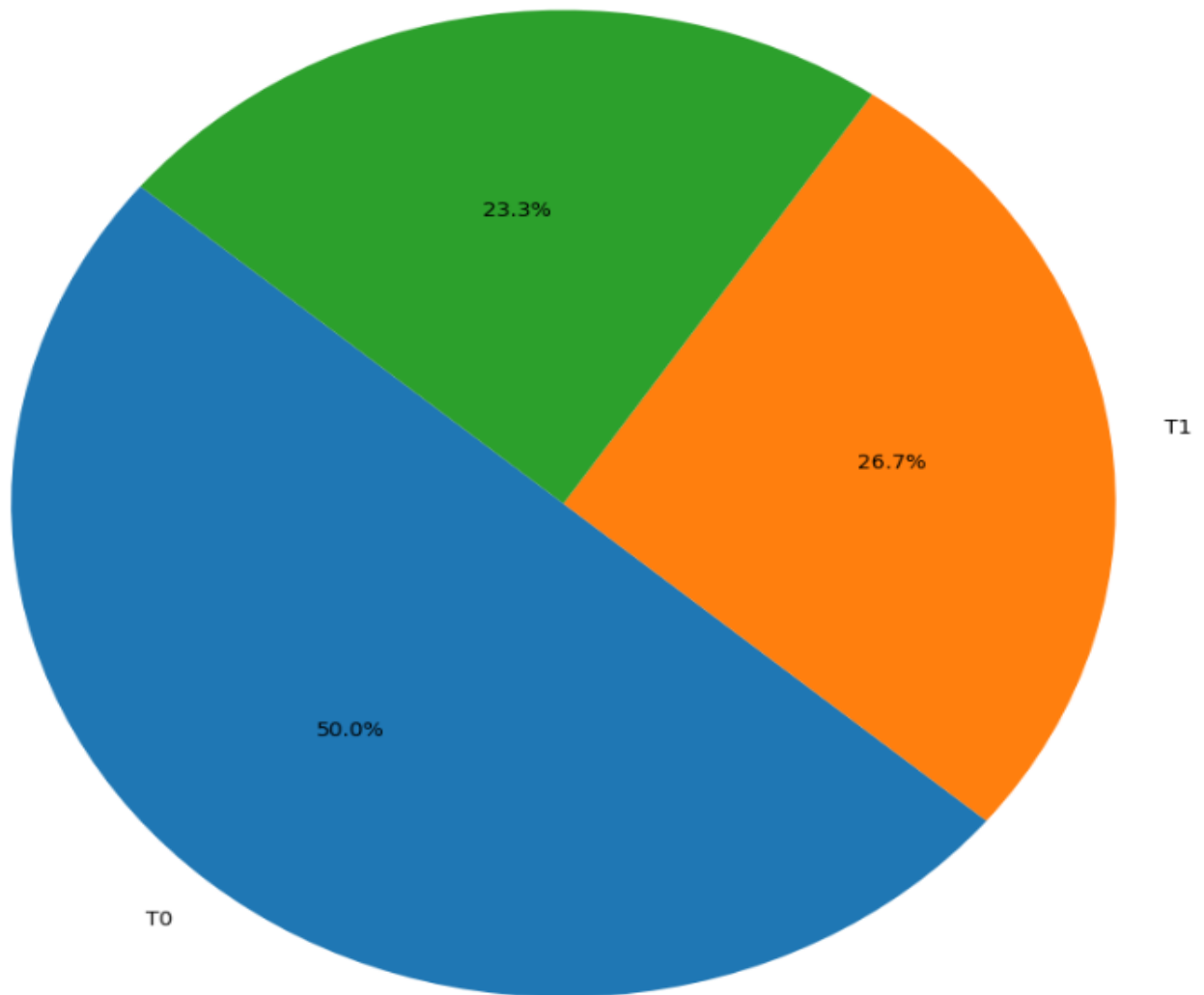
- `T0`: Rest
- `T1`: Onset of motion (real or imagined) of
 - Left fist
 - Both fists
- `T2`: Onset of motion (real or imagined) of
 - Right fist
 - Both feet

Event Distribution { T0 , T1 , T2 }

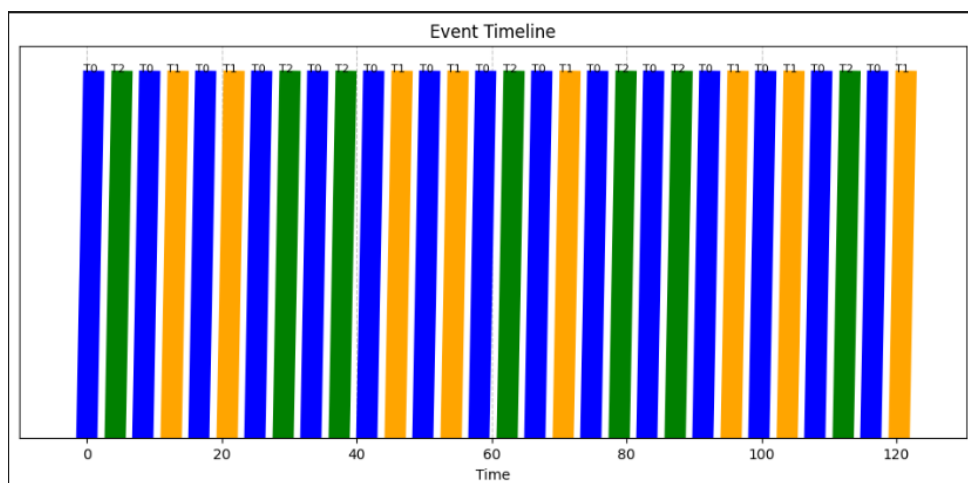
Annotations time of onsets:

```
[ 0.    4.2   8.3  12.5  16.6  20.8  24.9  29.1  33.2  37.4  41.5  45.7
 49.8  54.   58.1  62.3  66.4  70.6  74.7  78.9  83.   87.2  91.3  95.5
 99.6 103.8 107.9 112.1 116.2 120.4]
```

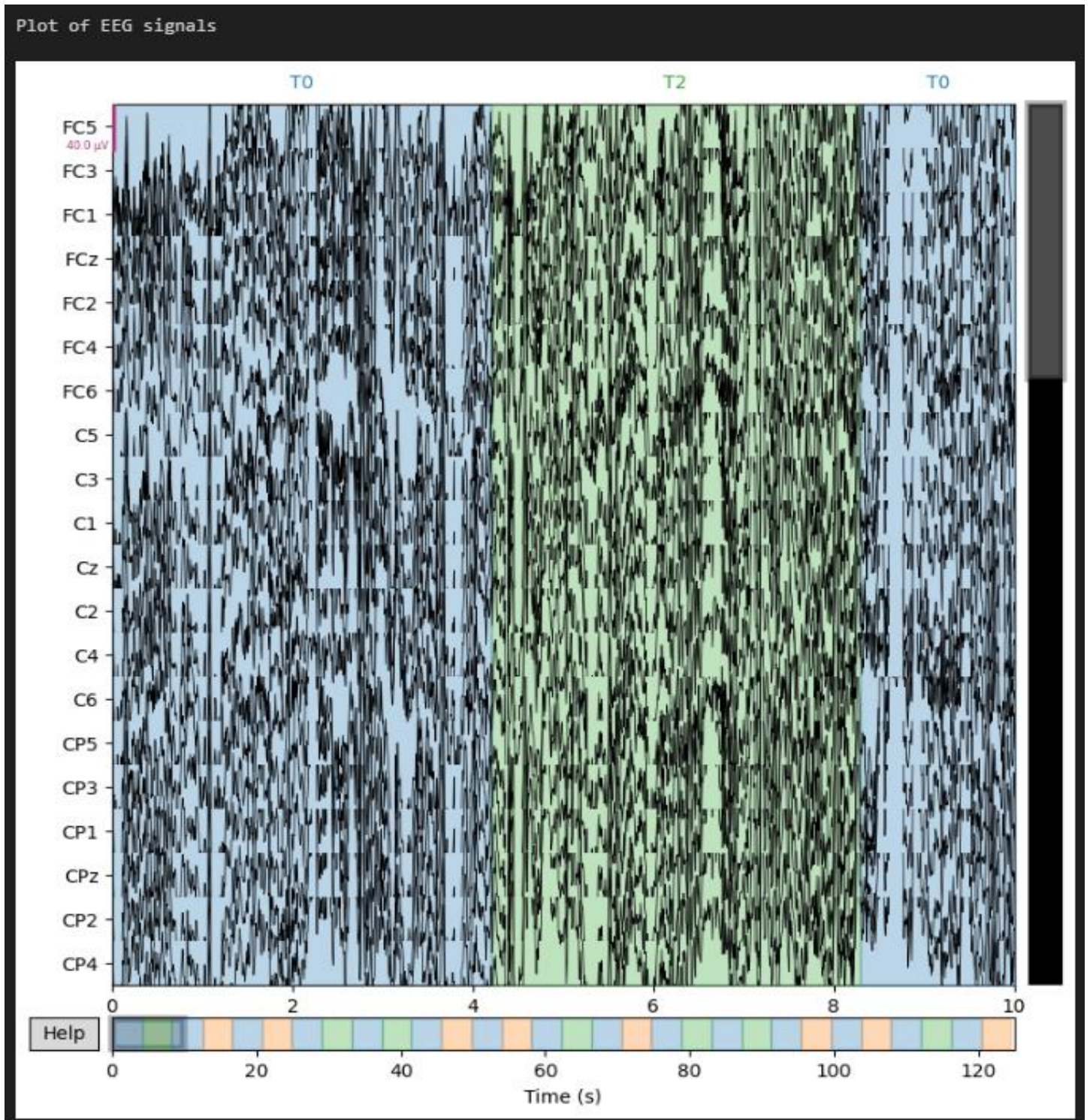
Event Distribution
T2



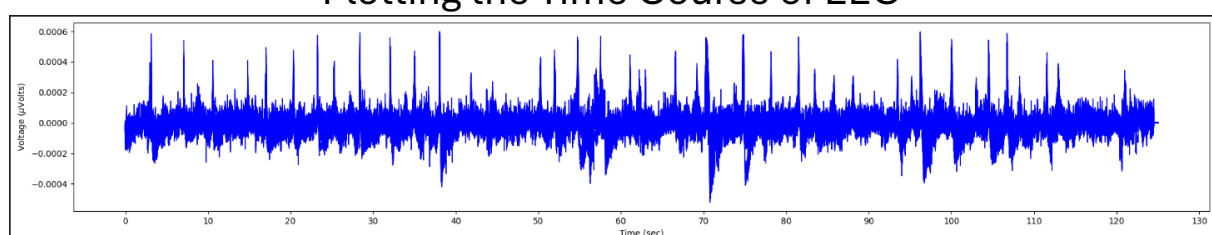
Event Timeline



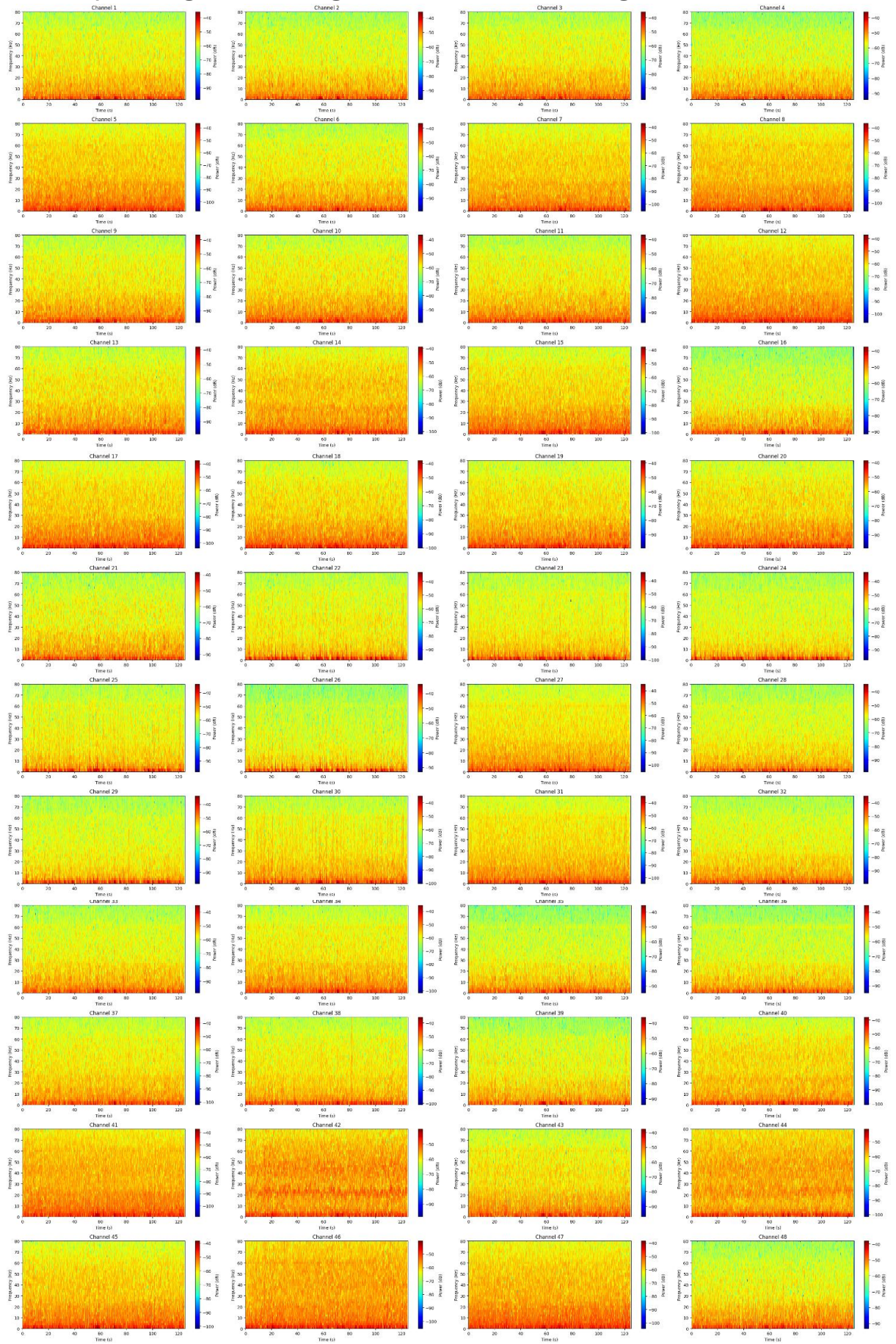
Plot of EEG Signals

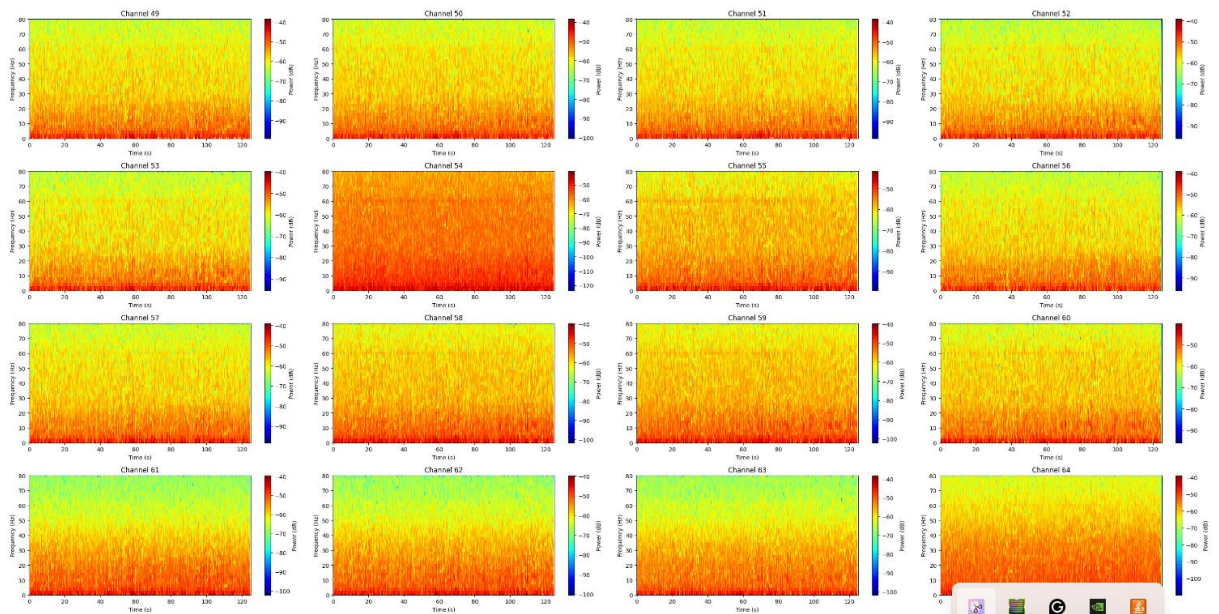


Plotting the Time Course of EEG

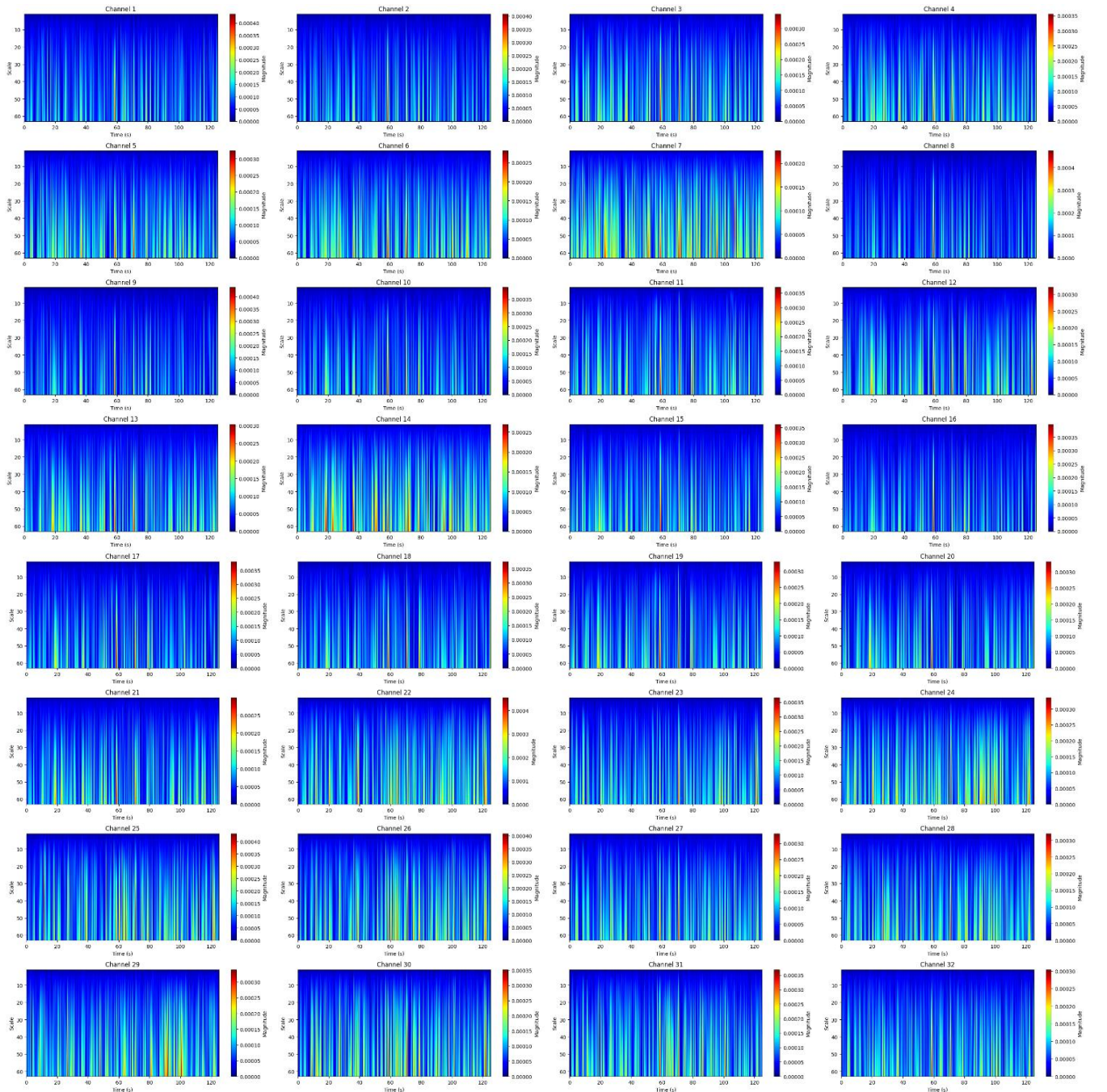


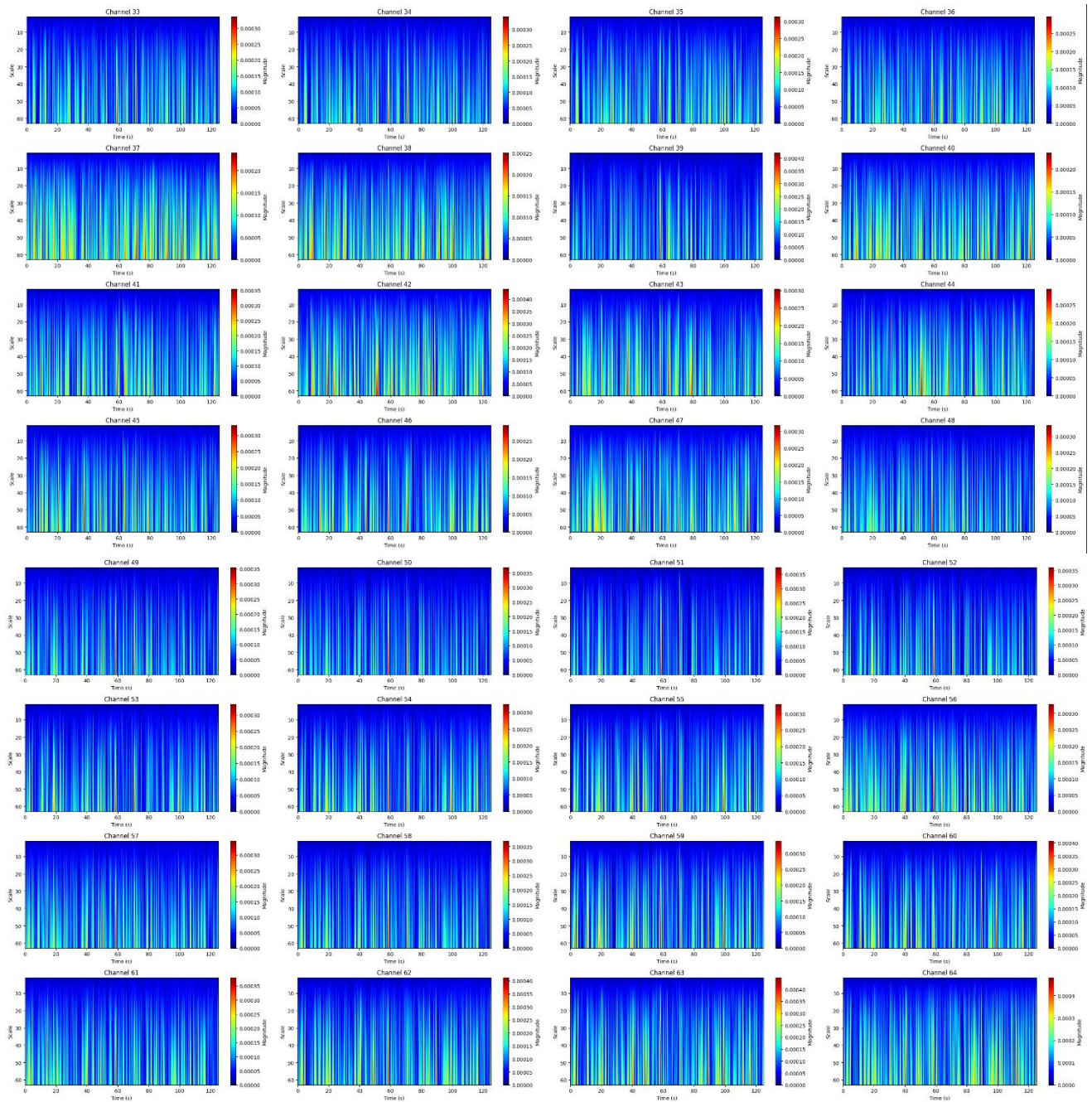
Spectrograms using STFT transform using Hann window



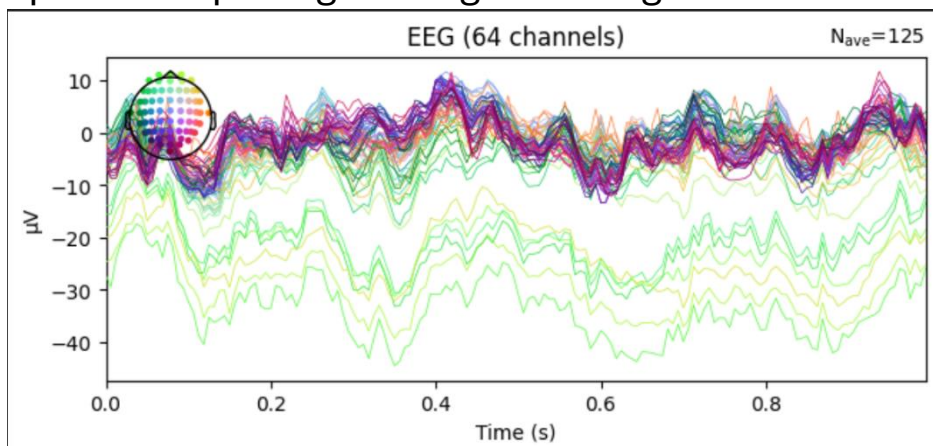


Wavelet Transforms and Visualisation of each channel

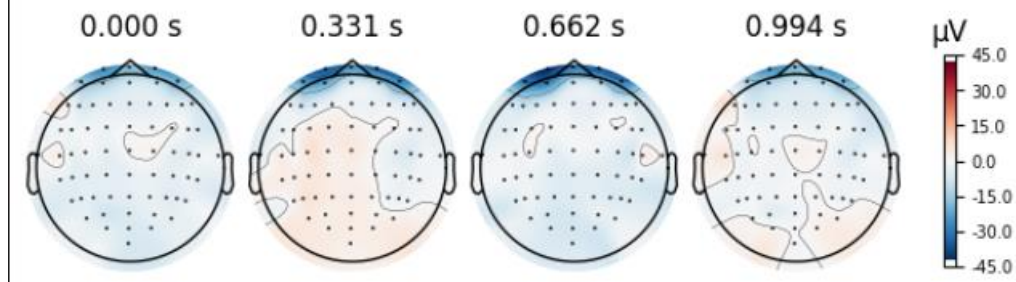




EEG plots for opening/closing of left/right fist for 1 Second

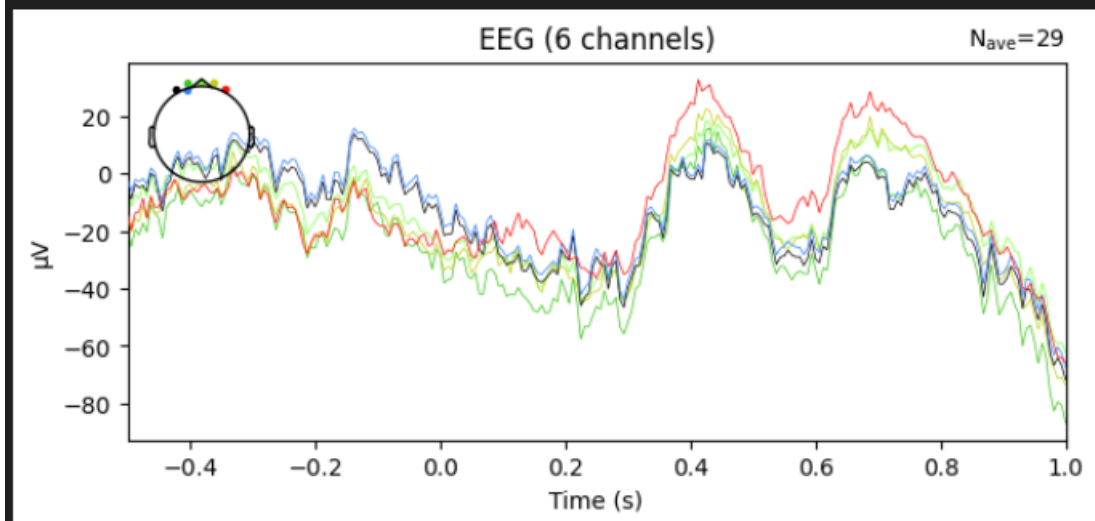


Topo Map for imagining of opening/closing of left/right fist

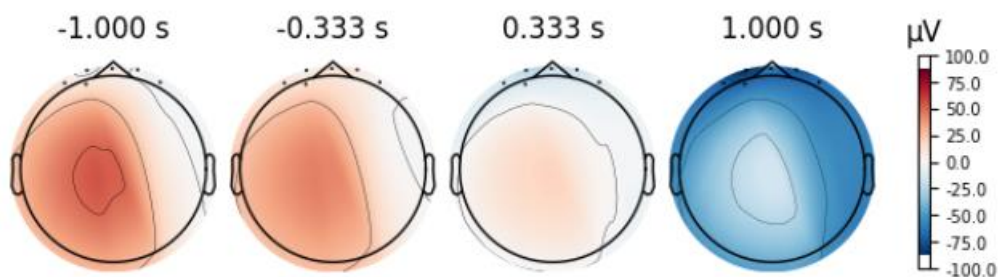


EEG plots for the 6 most significant ERP related frequencies

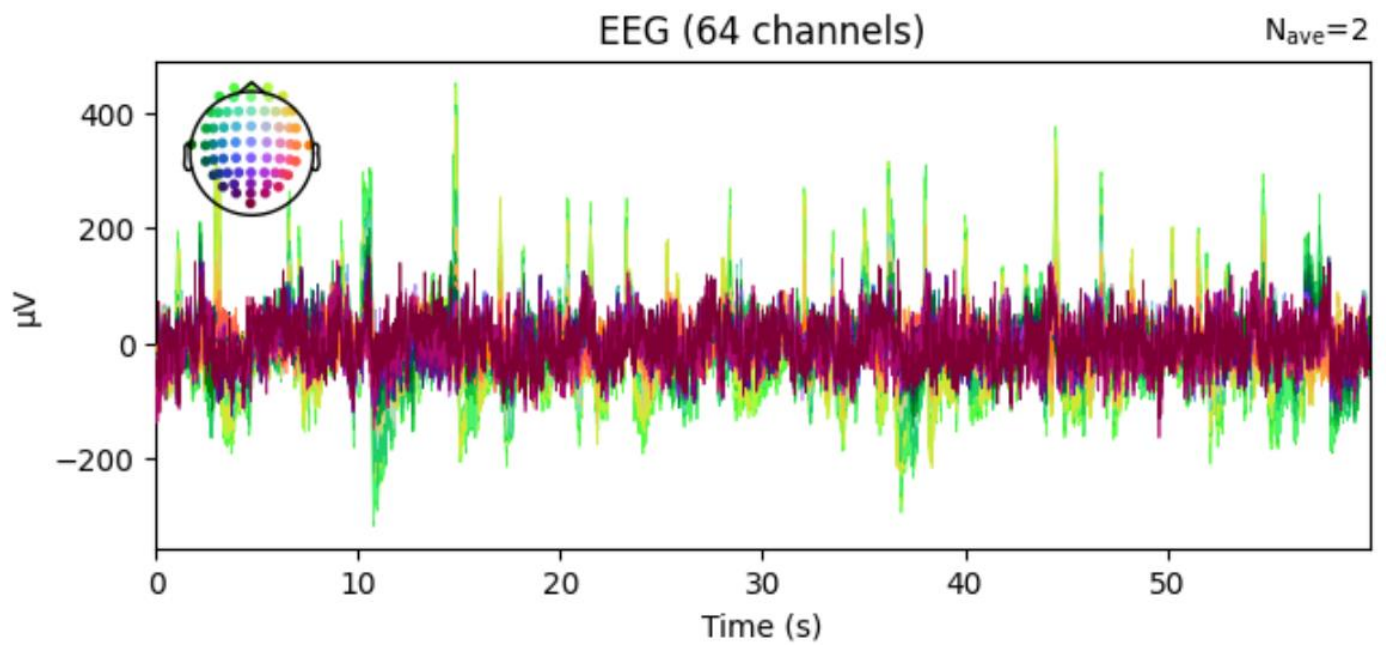
```
Channels with significant amplitude range: ['Fp1', 'Fpz', 'Fp2', 'AF7', 'AF3', 'AF8']
Used Annotations descriptions: ['T0', 'T1', 'T2']
Not setting metadata
30 matching events found
No baseline correction applied
0 projection items activated
Using data from preloaded Raw for 30 events and 241 original time points ...
1 bad epochs dropped
```



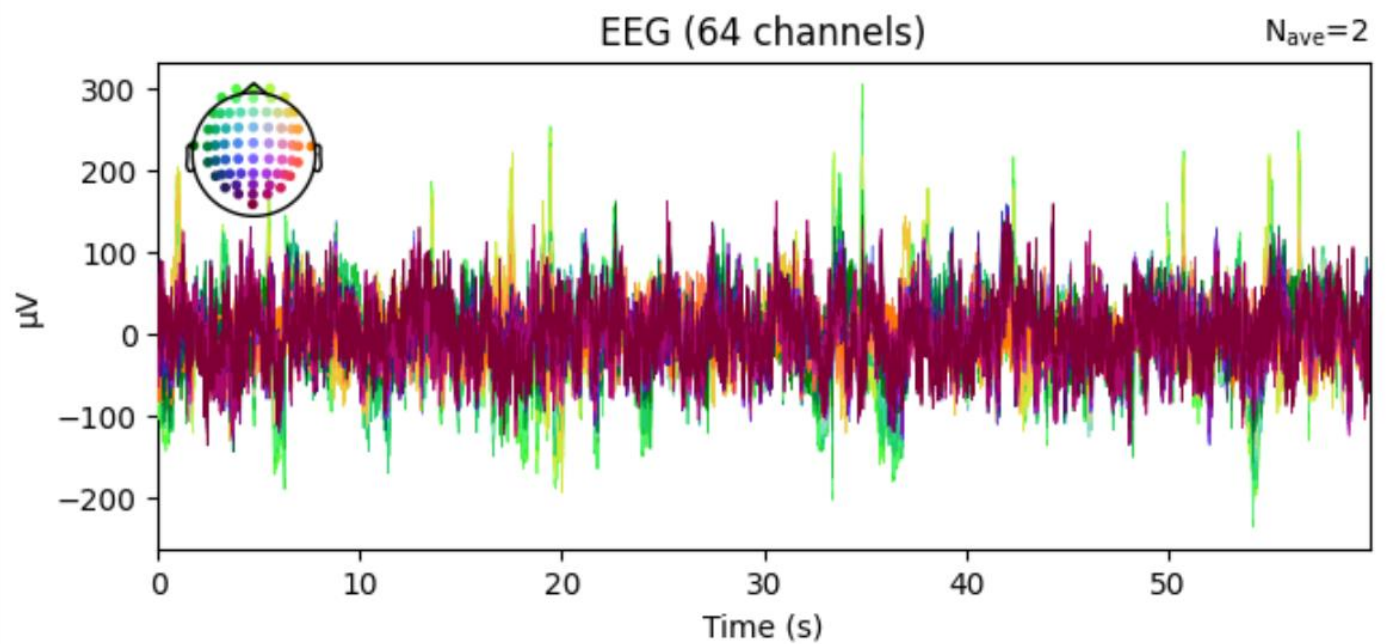
Topo Map for the 6 most significant ERP related frequencies



EEG Graphs for 60 seconds for
Opening/closing of left/right fist

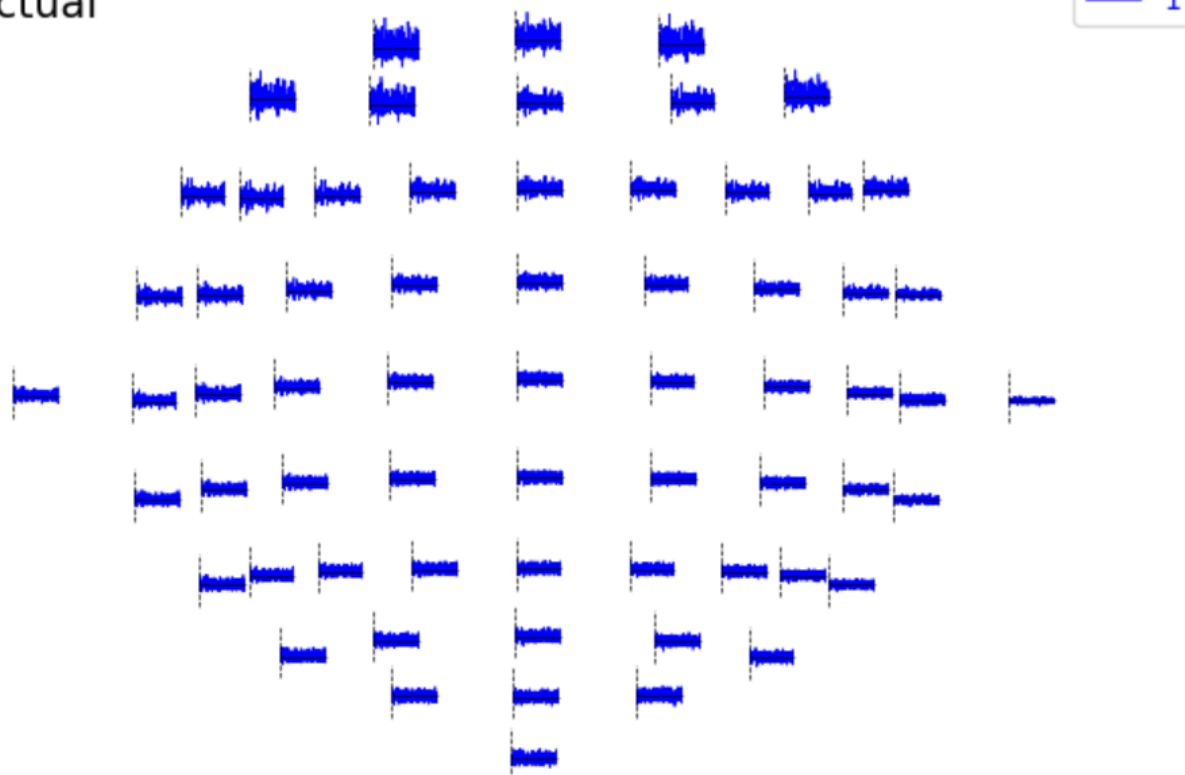


EEG Graphs for 60 seconds for imagining of
Opening/closing of left/right fist



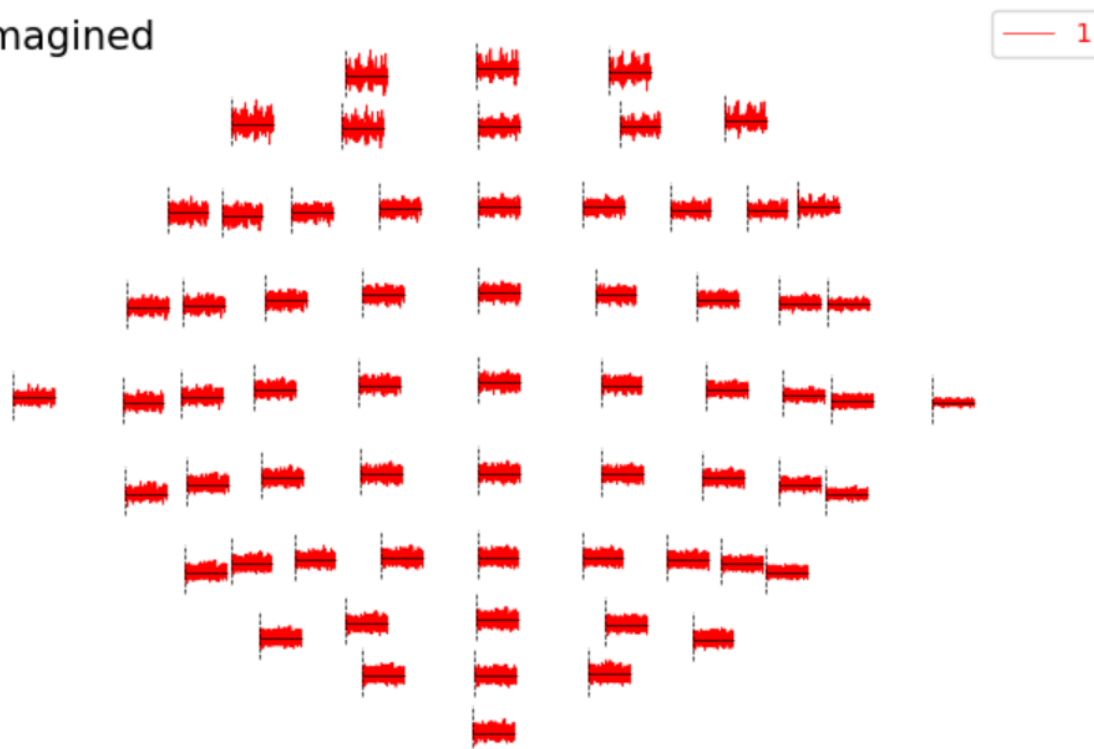
Topo Plot for opening/closing of left/right fist

actual

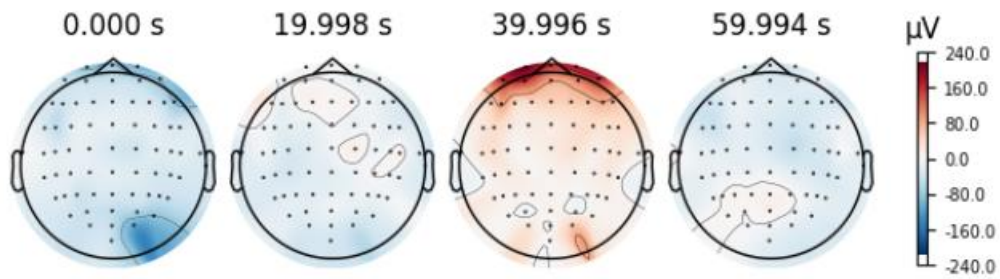


Topo Plot for imagining of opening/closing of left/right fist

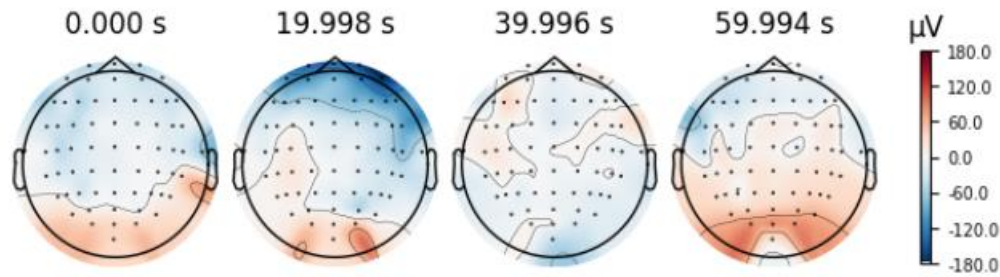
imagined



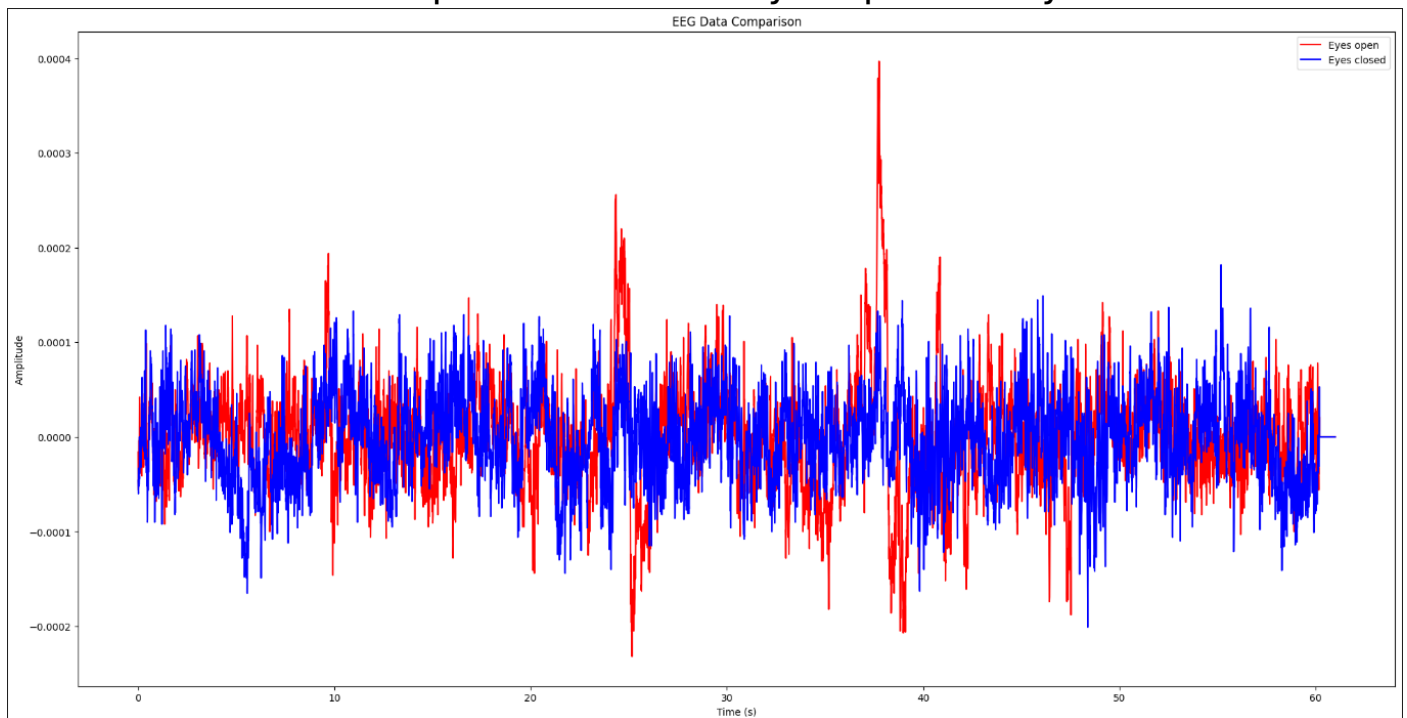
Topo Map for opening/closing of left/right fist



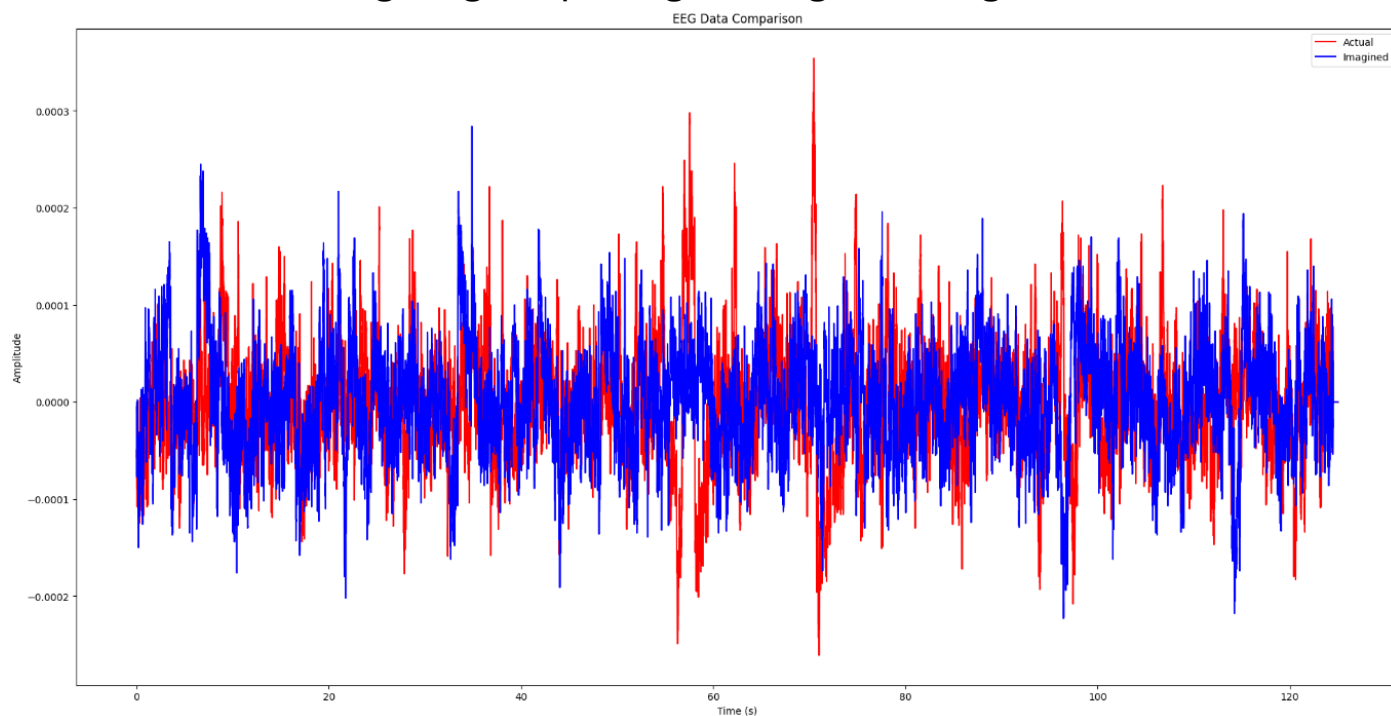
Topo Plot for imagining of opening/closing of left/right fist



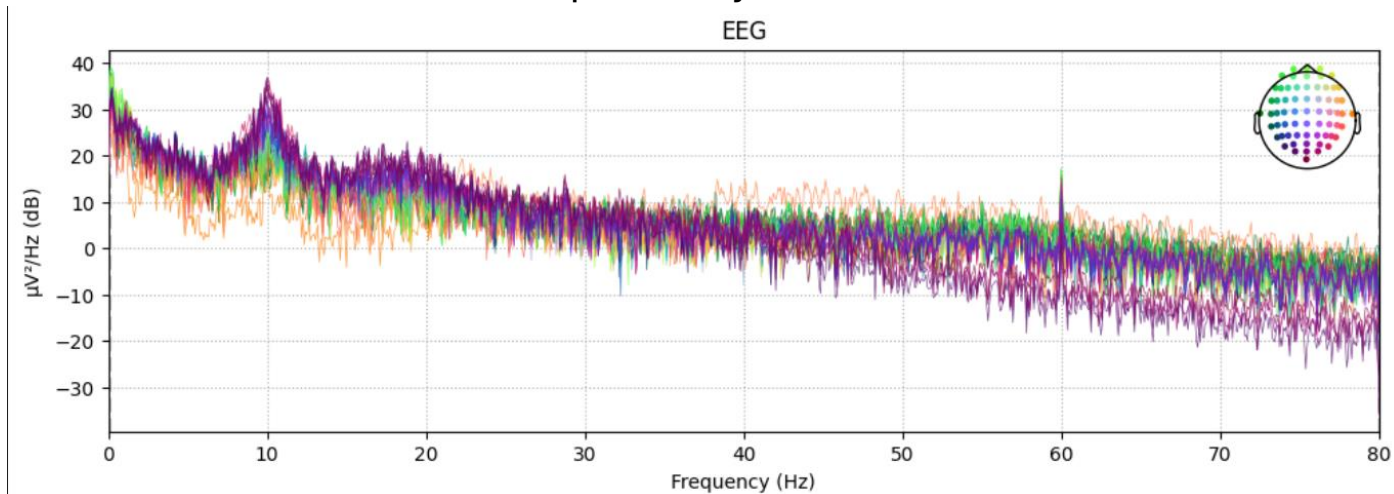
EEG data comparison between eyes open and eyes closed



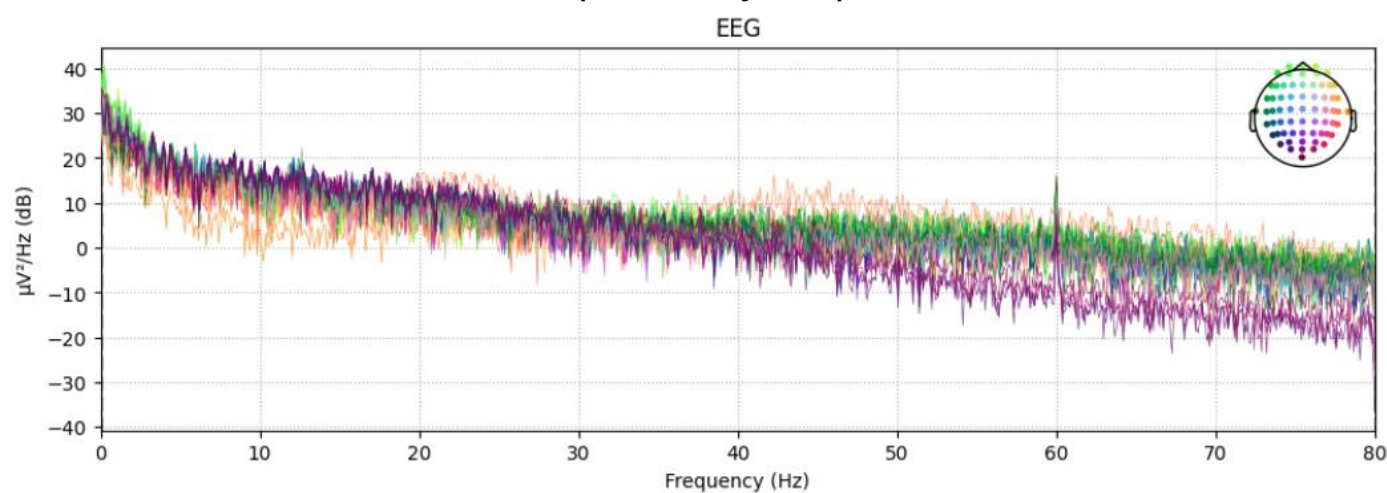
EEG data comparison between actually opening/closing of left/right fist and imagining of opening/closing of left/right fist



PSD plot for eyes closed



PSD plot for eyes open



PSD plot for opening and closing of fist for all channels from FC5 to P3

