GROUP-25

Members:

1) Akash Kulkarni (S20210010011)
2) Divyank Khajuria (S20210010068)

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

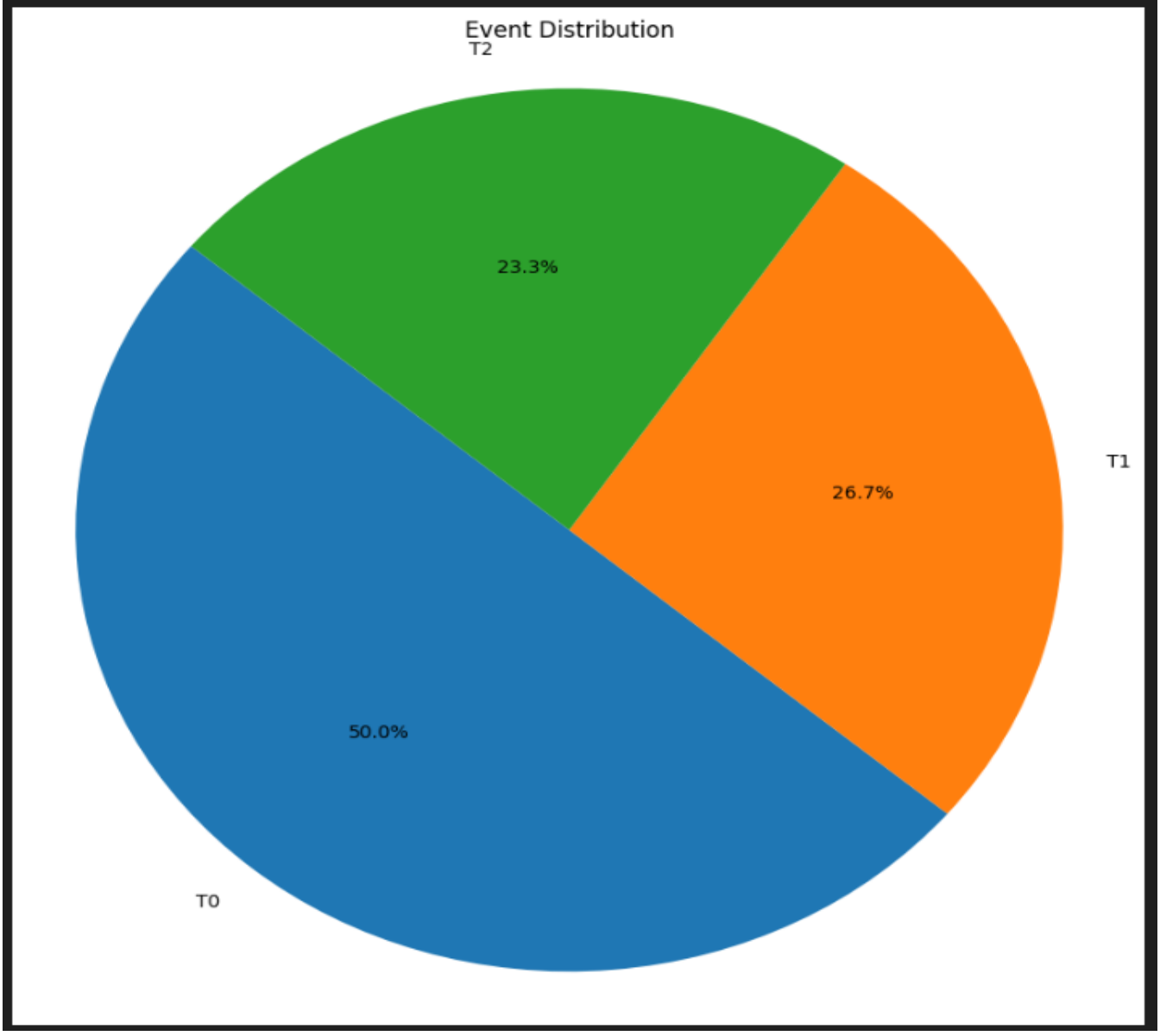
Summary of Experimental Runs
1. Baseline, eyes open
2. Baseline, eyes closed
3. Task 1 (open and close left or right fist)
4. Task 2 (imagine opening and closing left or right fist)
5. Task 3 (open and close both fists or both feet)
6. Task 4 (imagine opening and closing both fists or both feet)
7. Task 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

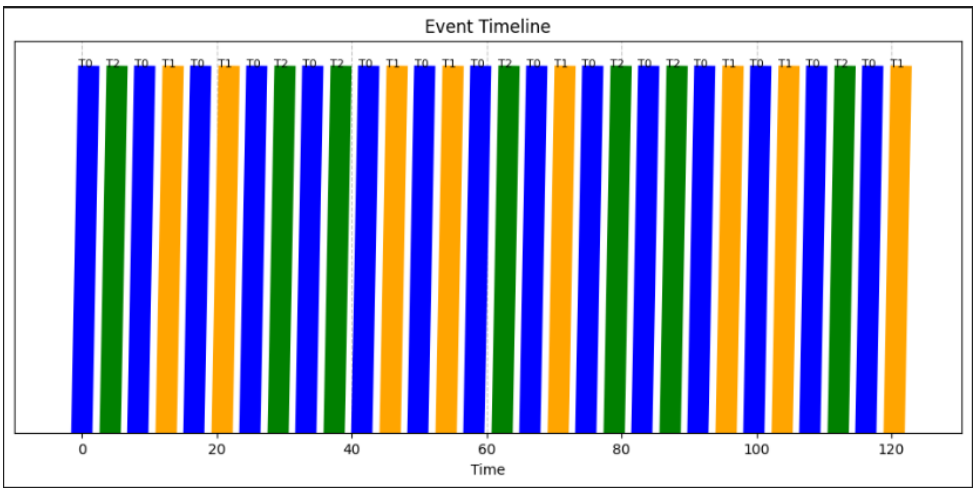
Annotations
Each annotation includes one of three codes (`T0`, `T1`, or `T2`):
- `T0`: Rest
- `T1`: Onset of motion (real or imagined) of
  - Left fist
  - Both fists
- `T2`: Onset of motion (real or imagined) of
  - Right fist
  - Both feet

Event Distribution { T0 , T1 , T2 }

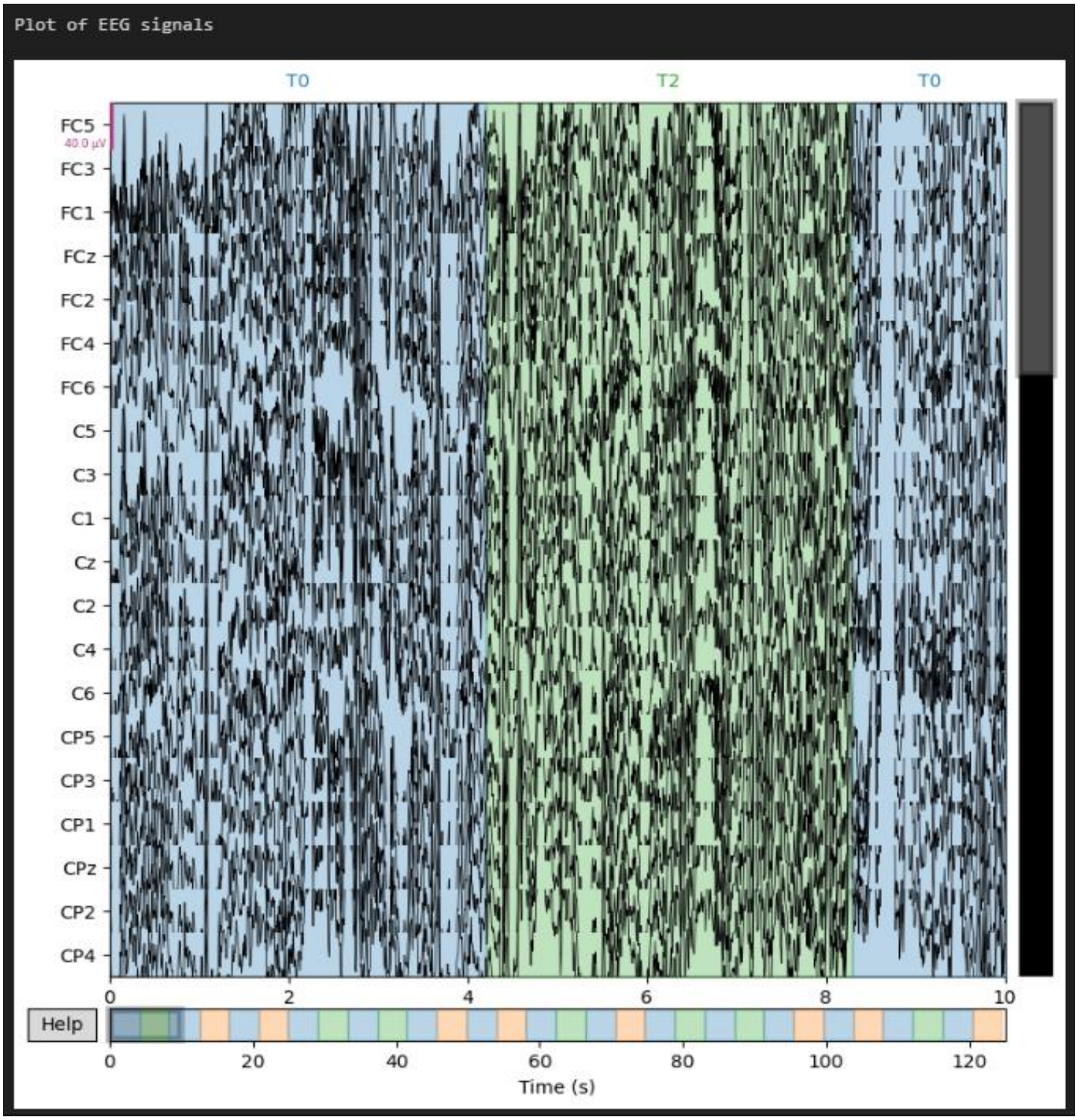
```
Annotations time of onsets:
[  0.    4.2   8.3  12.5  16.6  20.8  24.9  29.1  33.2  37.4  41.5  45.7
  49.8  54.   58.1  62.3  66.4  70.6  74.7  78.9  83.   87.2  91.3  95.5
  99.6 103.8 107.9 112.1 116.2 120.4]
```



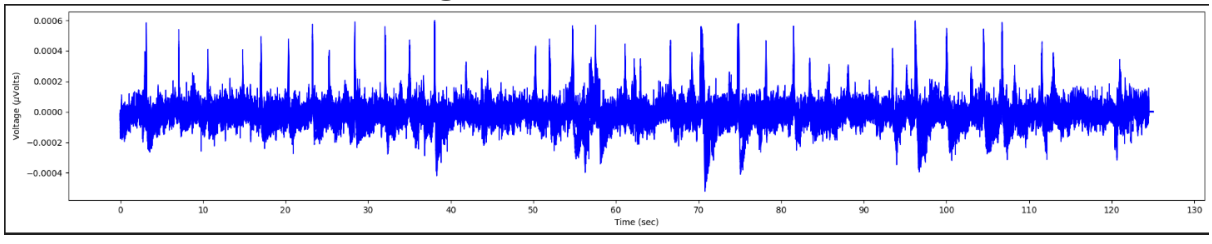
Event Timeline



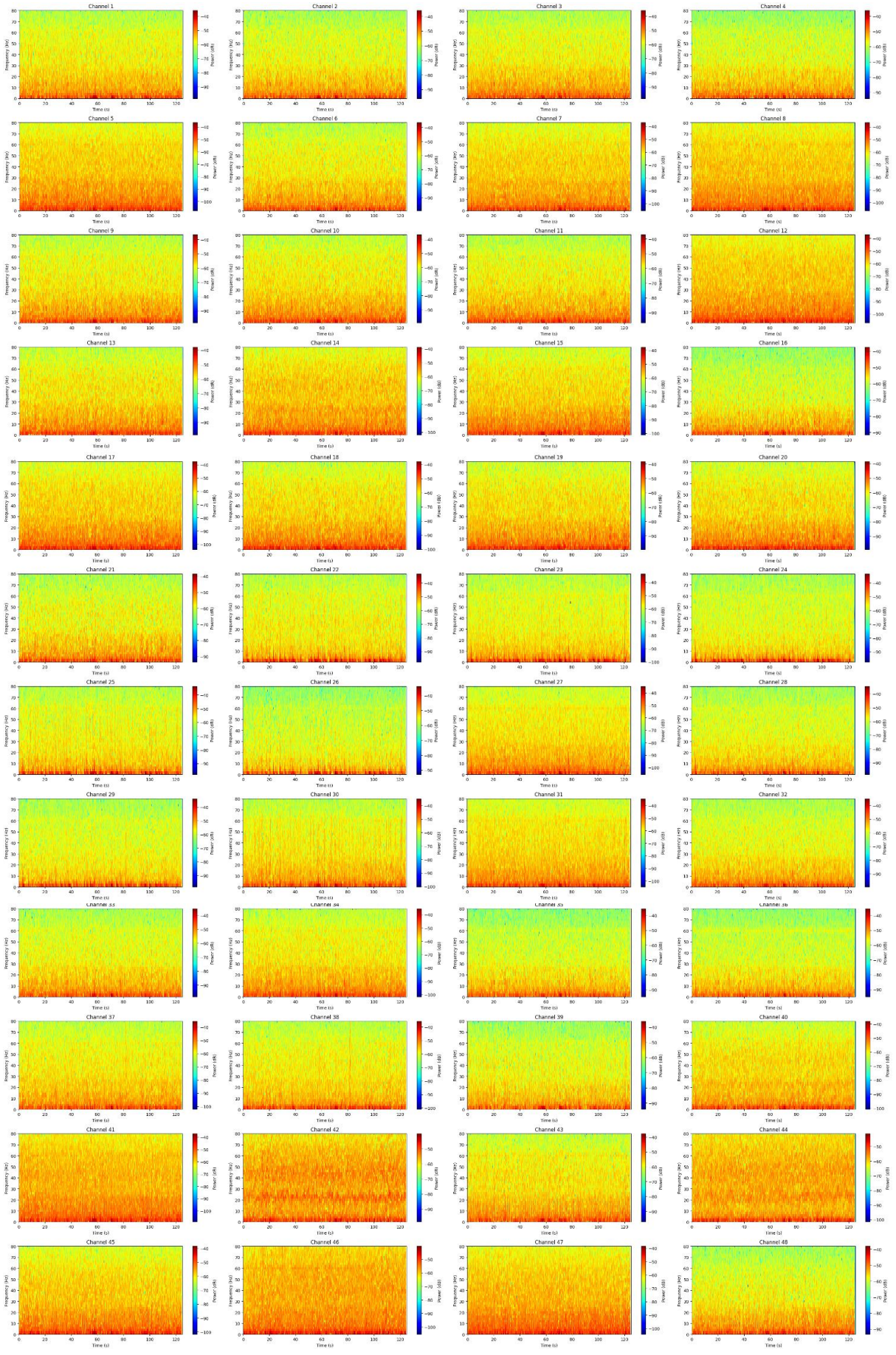
Plot of EEG Signals

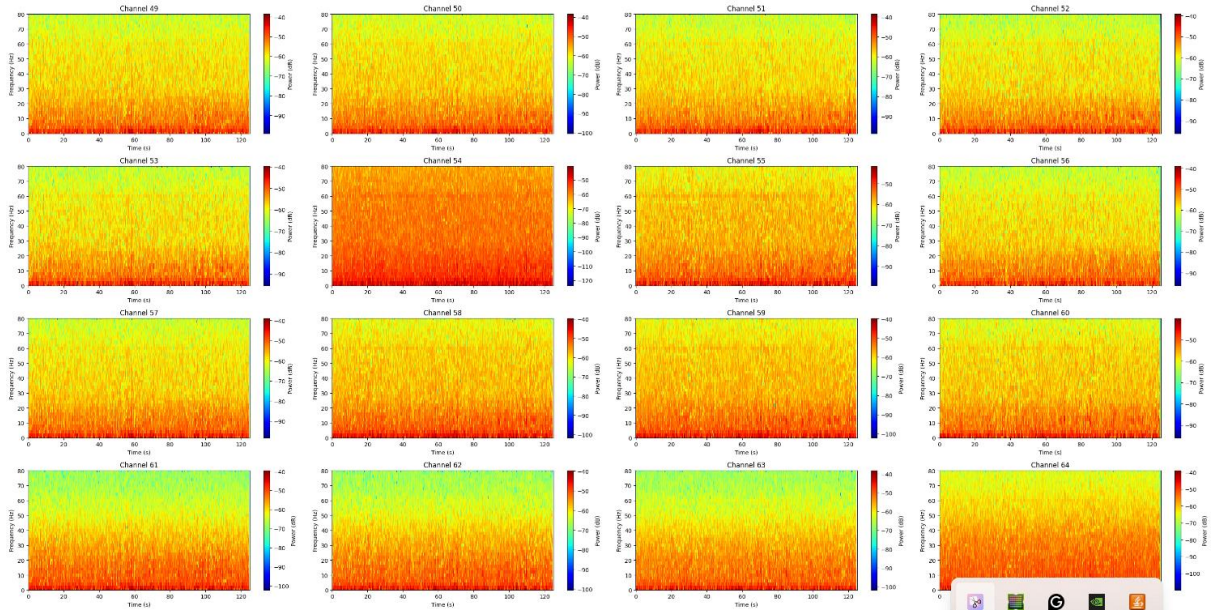


Plotting the Time Course of EEG

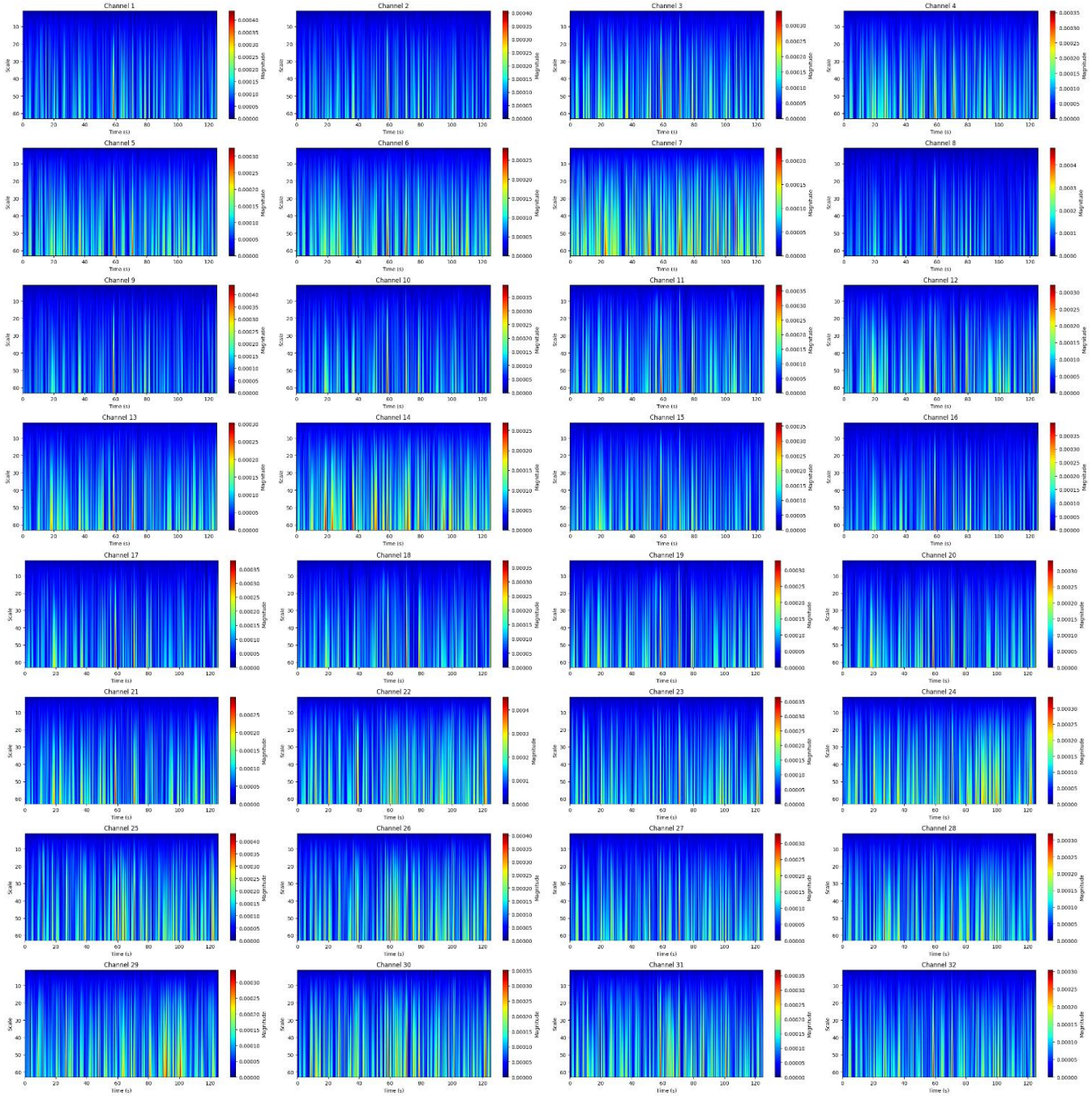


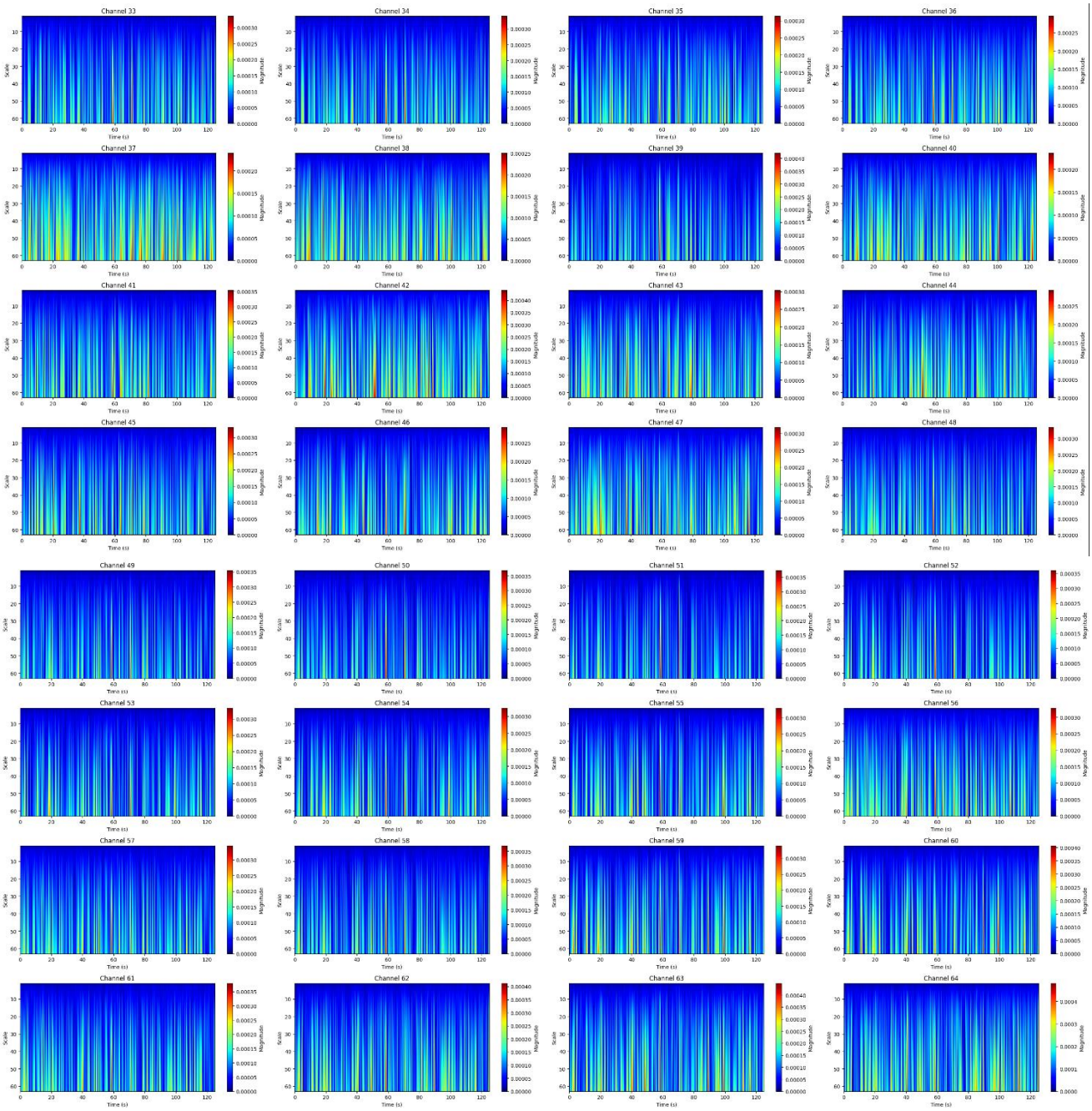
Spectrograms using STFT transform using Hann window



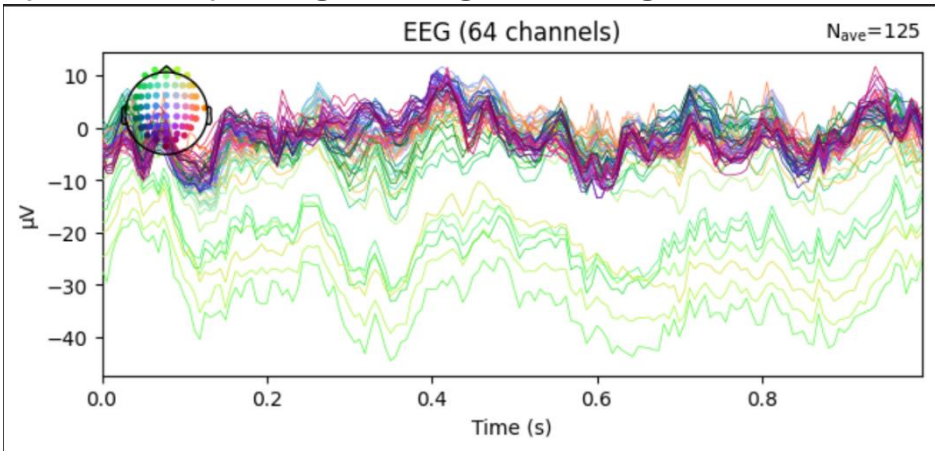


Wavelet Transforms and Visualisation of each channel

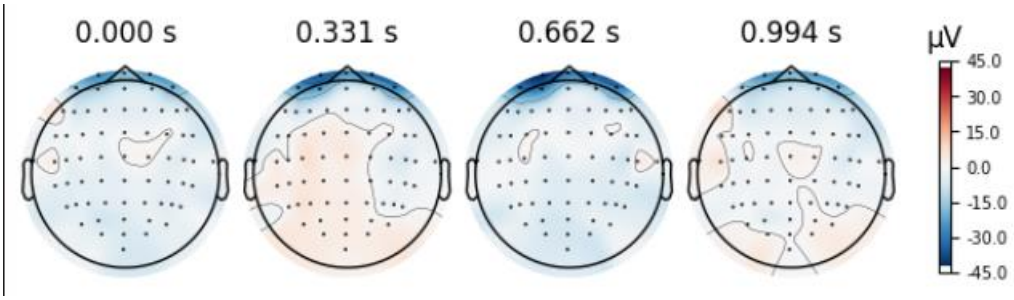




EEG plots for opening/closing of left/right fist for 1 Second

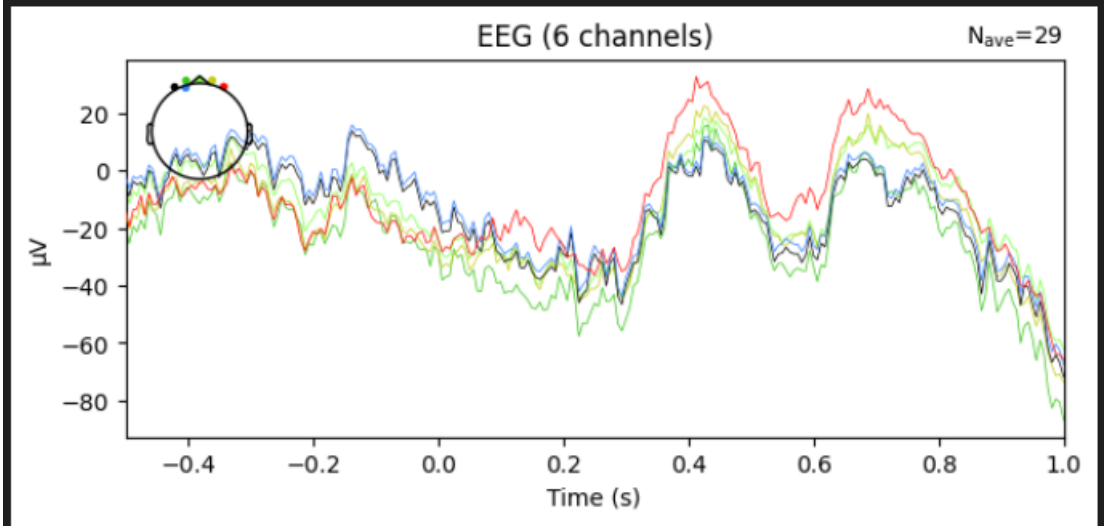


Topo Map for imagining of opening/closing of left/right fist

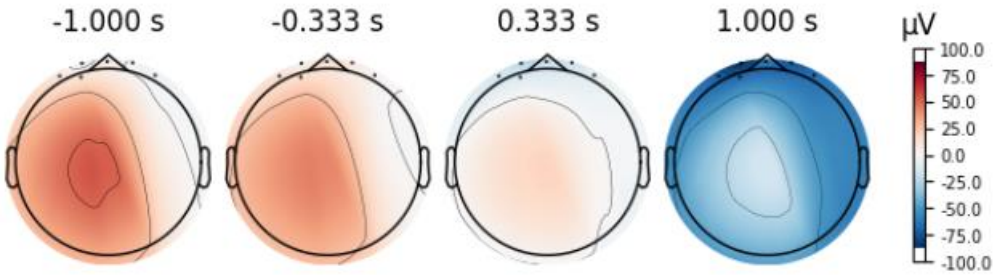


EEG plots for the 6 most significant ERP related frequencies

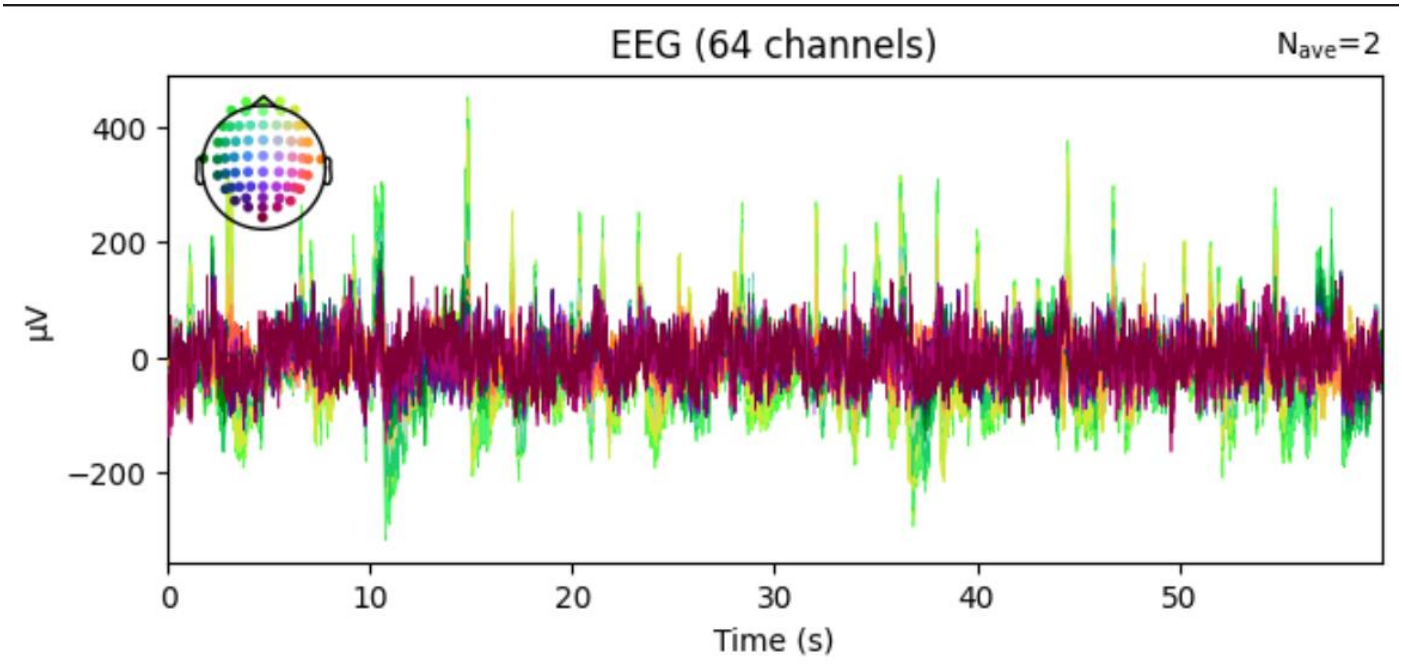
```
Channels with significant amplitude range: ['Fp1', 'Fpz', 'Fp2', 'AF7', 'AF3', 'AF8']
Used Annotations descriptions: ['T0', 'T1', 'T2']
Not setting metadata
30 matching events found
No baseline correction applied
0 projection items activated
Using data from preloaded Raw for 30 events and 241 original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



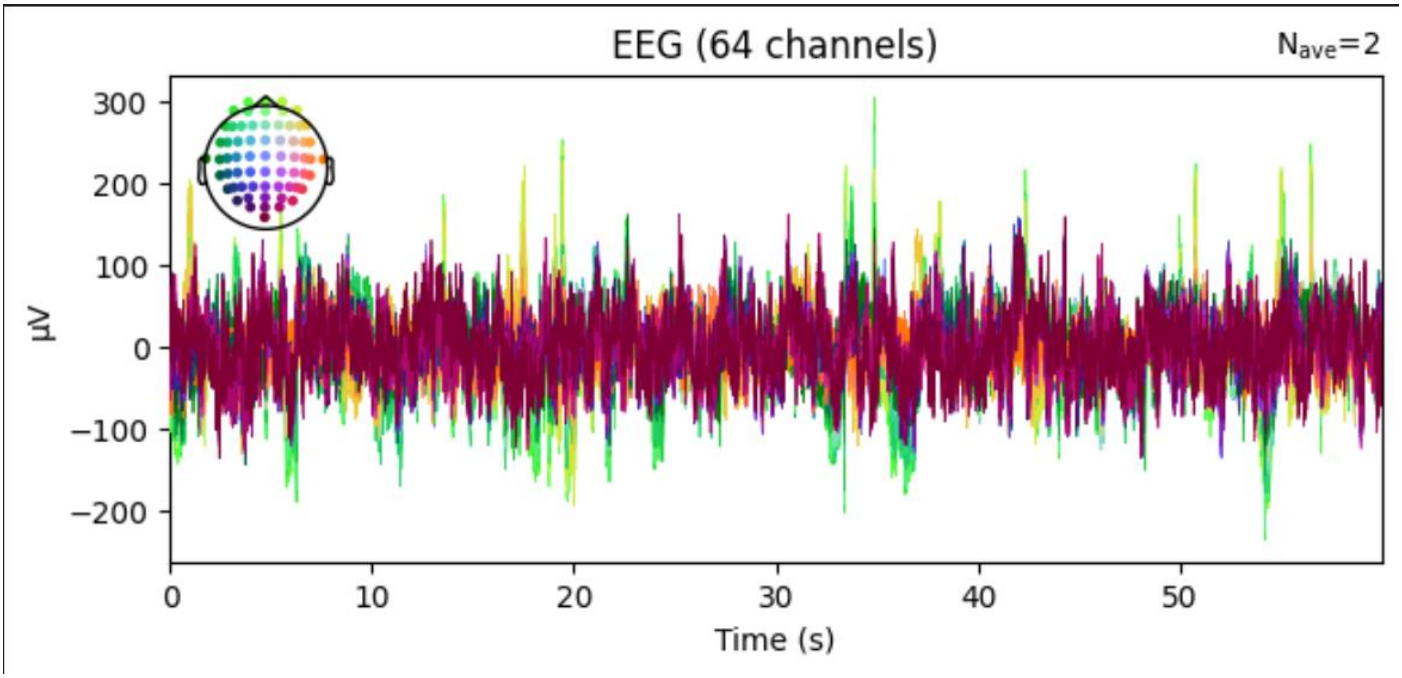
Topo Map for the 6 most significant ERP related frequencies



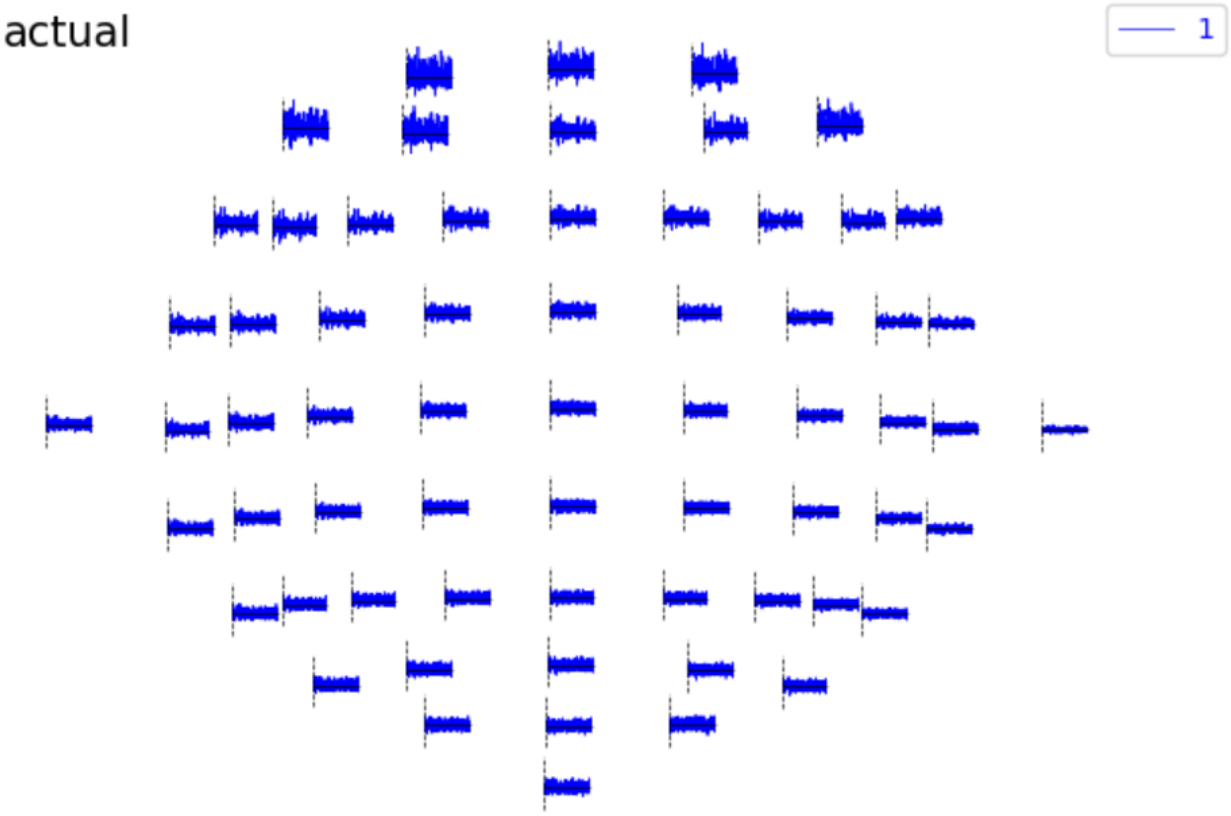
EEG Graphs for 60 seconds for
Opening/closing of left/right fist



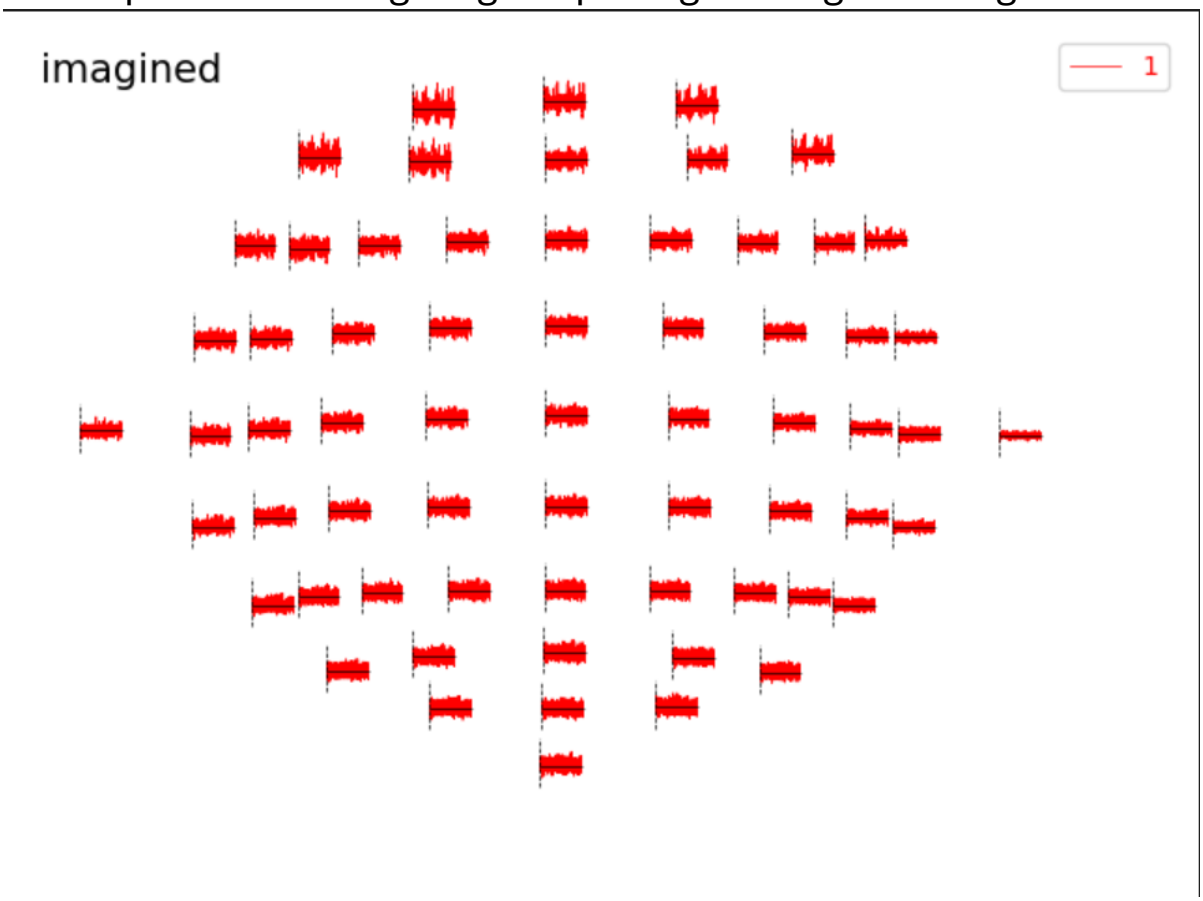
EEG Graphs for 60 seconds for imagining of
Opening/closing of left/right fist



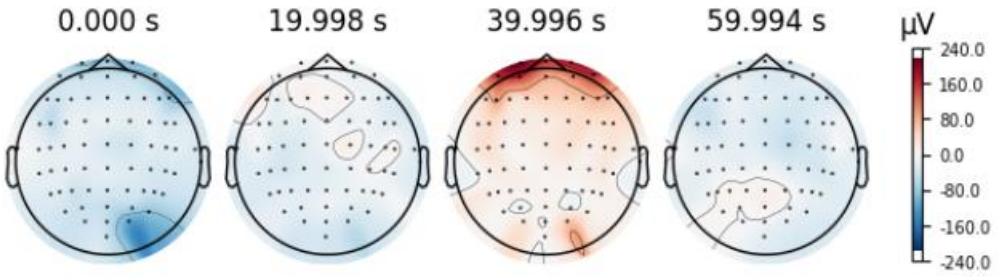
Topo Plot for opening/closing of left/right fist



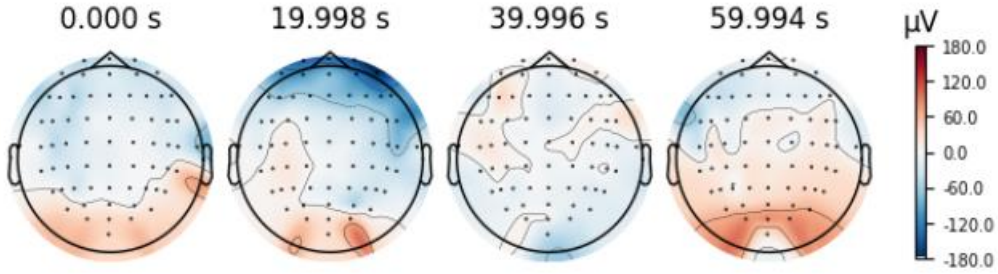
Topo Plot for imagining of opening/closing of left/right fist



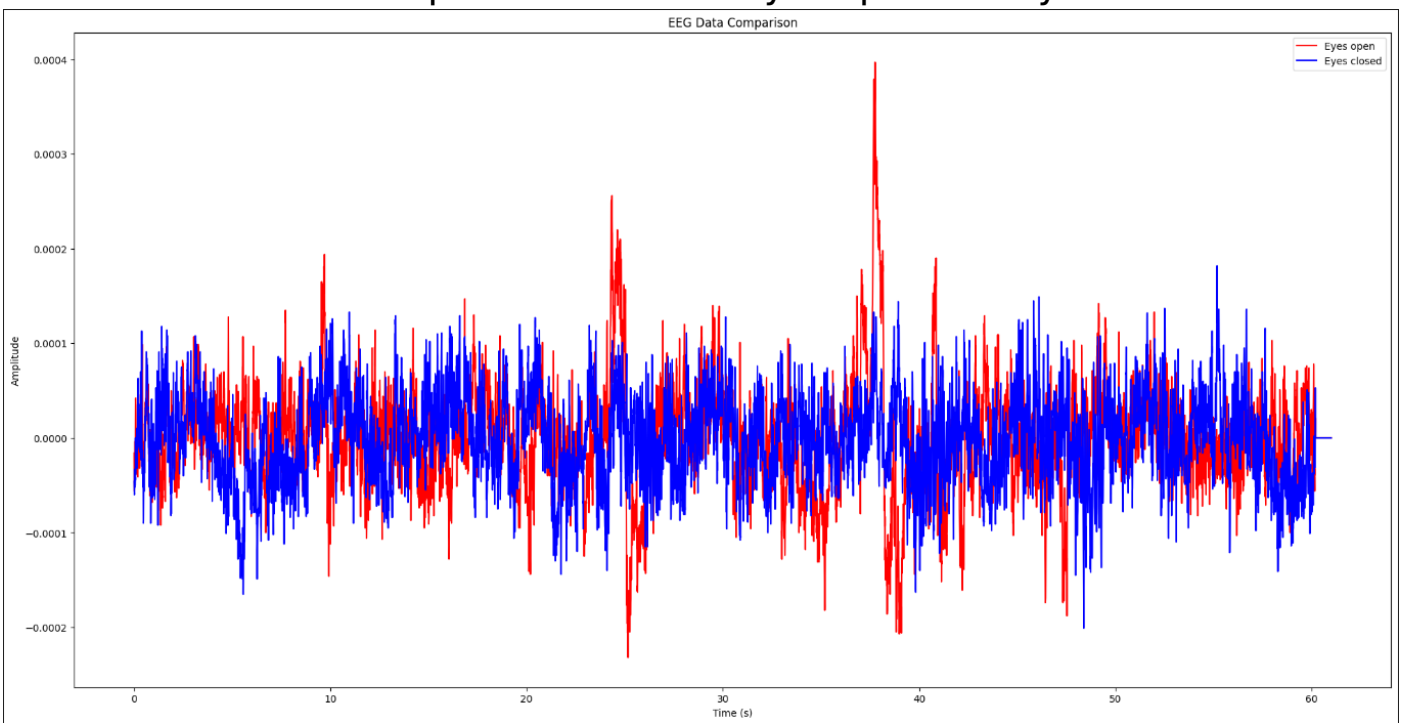
Topo Map for opening/closing of left/right fist



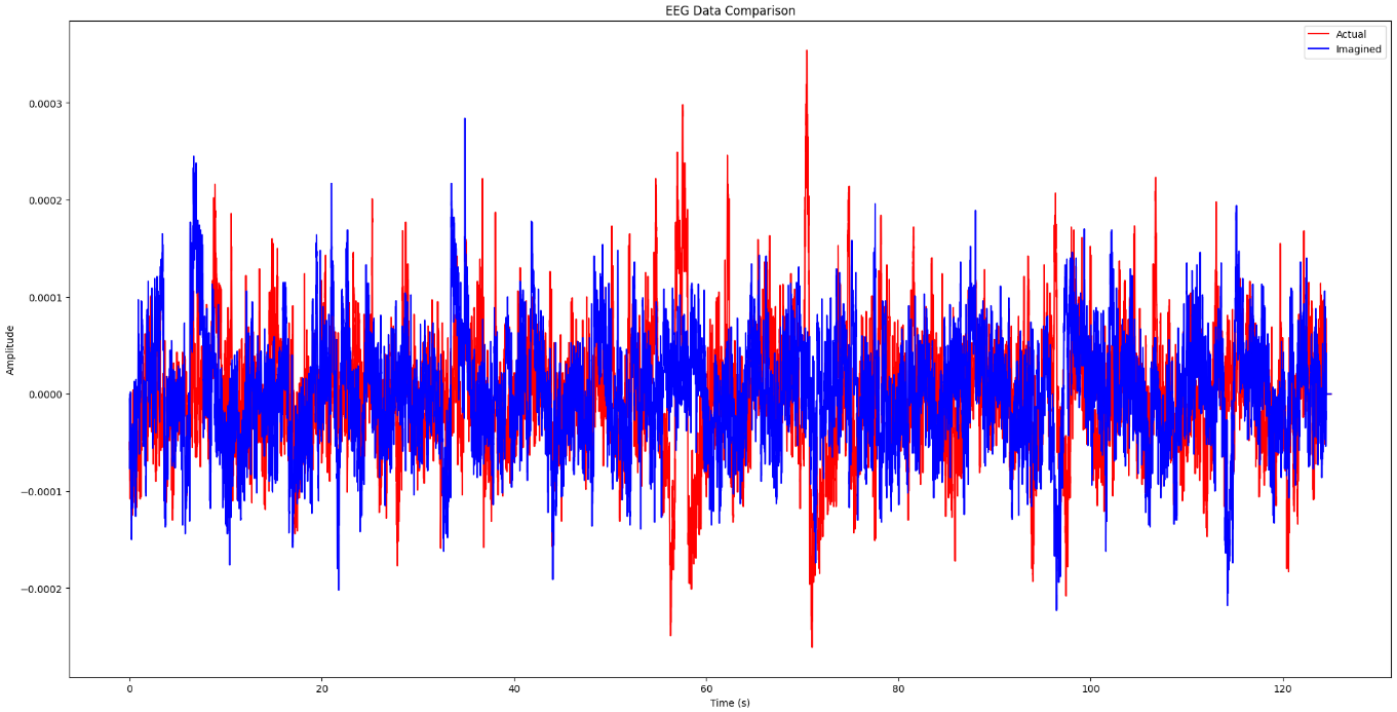
Topo Plot for imagining of opening/closing of left/right fist



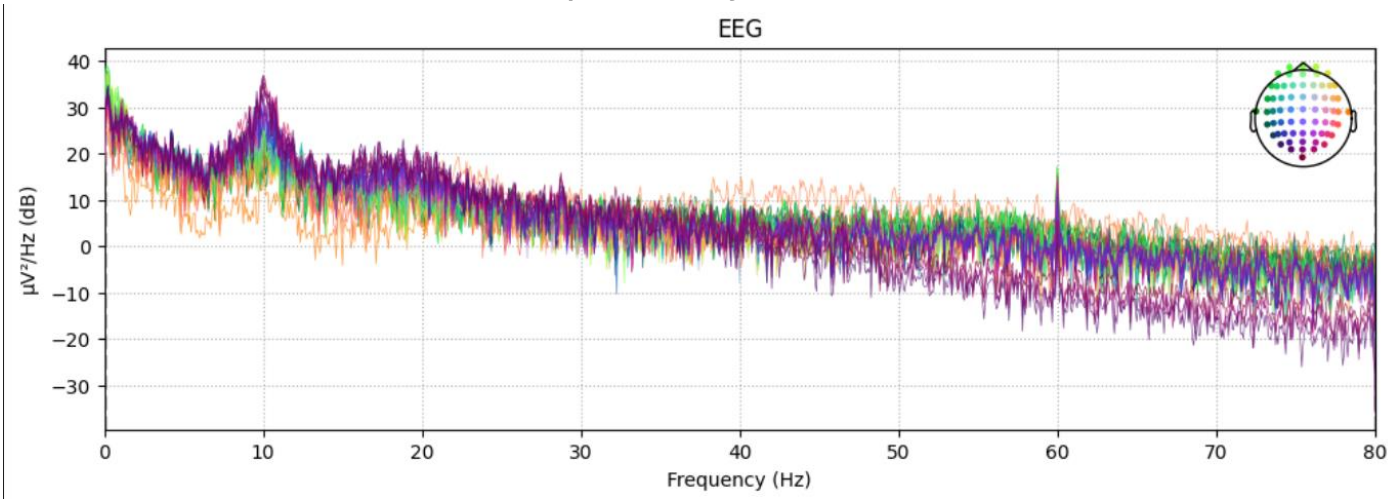
EEG data comparison between eyes open and eyes closed



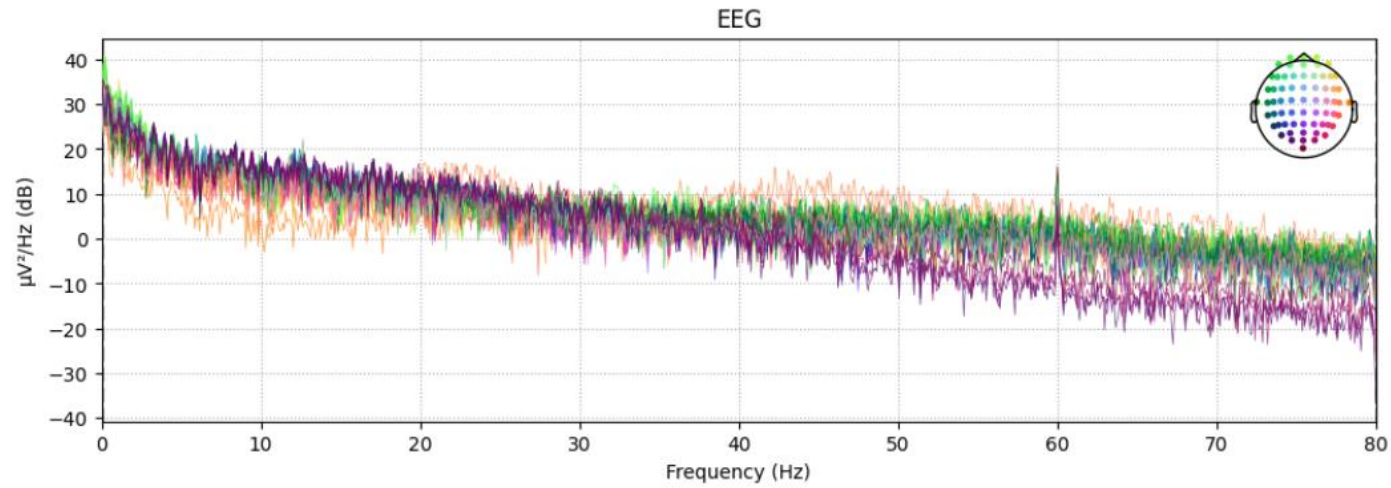
EEG data comparison between actually opening/closing of left/right fist and imagining of opening/closing of left/right fist



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