Purpose:

In this project we tried to identify finger motor imagery from EEG signals and train a machine learning model for this purpose.

Challenges:

- Computational cost of multiple EEG electrode analysis
- curse of feature dimensionality
- defining proper features

Approaches:

Step 1: extracting each finger motor imagery samples

Step2: ranking electrodes based on sequential forward algorithm (SFS) for choosing the most related electrodes for finger motor imagery. Identifying the optimal number of electrodes for this processing.

Step3: defining features based on FFT coefficients and first derivative of FFT coefficients in frequency range of 0 to 10 Hz

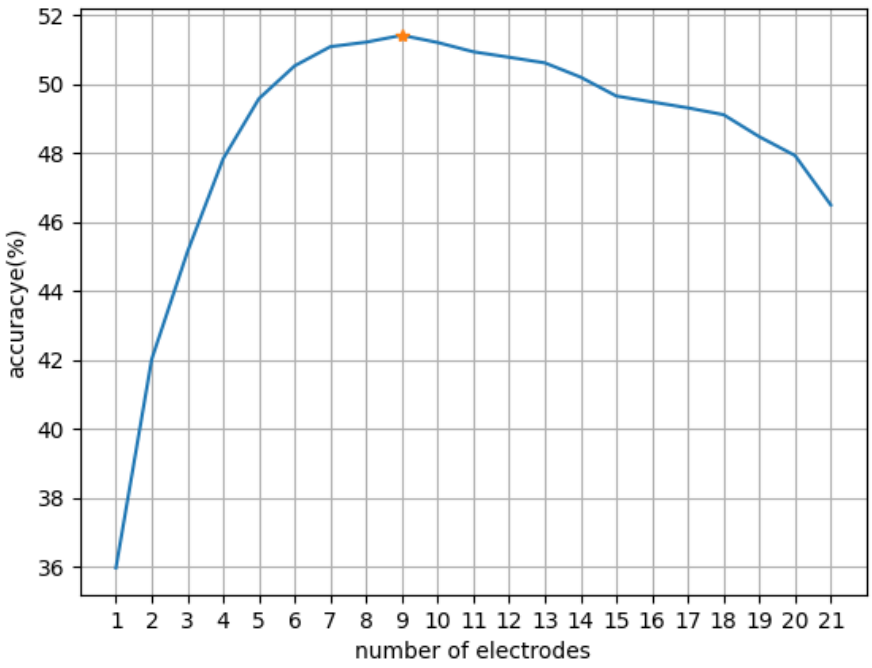
Step 5: investigate the effect of normalization in accuracy of SVM and LDA classifier

Step 6: ranking feature based on chi square criteria and using top 180 highest ranked features

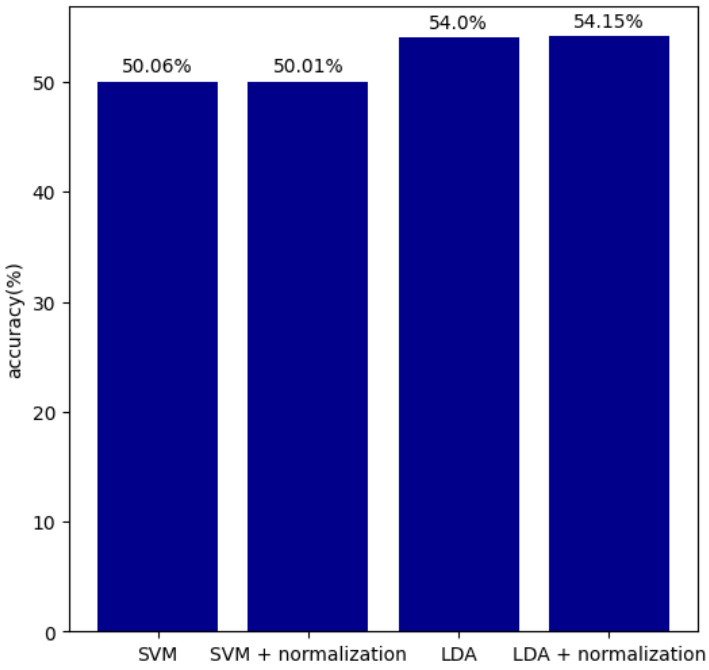
Step7: combine all of the above steps into a compact function

Result:

- Electrode selection:



- Normalization:



- Best result for each EEG recording session (with 9 electrodes and best possible numbers of features):

Session	Number of features	Accuracy
1	45	25.74
2	155	66.01
3	150	50.45
4	17	50.58
5	145	45.41
6	140	62.98
7	165	67.16
8	180	62.11
9	165	64.13
10	175	74.10
11	125	61.32
12	120	55.89
13	150	54.65
14	140	40.09
15	110	45.78
16	125	46.18

Requirements:

Python packages:

- Scipy
- Numpy
- Pandas
- Scikit-learn
- keras