

CSCE 363/3611 – Digital Signal Processing

Project

(Due on: July 21, 2024 at mid-night)
(Submit on Canvas as one .zip file)

Implement the two approaches described in Slide 15 in the attached file “SSVEP.pdf”. Data of 2 different subjects is provided. For each subject, you will find 2 files as follows:

- EEG_SubjectX.csv: Each row represents the signal recorded for one EEG electrode and each column represents a sample. Total number of electrodes is 14.
- Stimulus_SubjectX.csv: Each value represents the stimulus (1 to 5 representing the 5 different frequencies or 0 representing the break)

The sampling rate of the data is 128Hz.

Deliverables:

- Your code
- Plot the spectrum of each of the channels O1 and O2 for Subject 1 before applying the Common Average Reference (CAR) filter and after applying it for each of the 5 stimuli.
- Based on the plots, comment on the impact of the CAR filter on the recorded data.
- For each of the 2 subjects, find the classification accuracy using Method 1 as evaluated by the leave-one-trial-out approach once using electrode O1 only and once using electrode O2 only.
- For each of the 2 subjects, find the classification accuracy using Method 1 as evaluated by the leave-one-trial-out approach when combining electrodes O1 and O2. Suggest a method for the combination.
- For each of the 2 subjects, identify the value of K using Method 2 that achieve the best accuracy as evaluated by the leave-one-trial-out approach once using electrode O1 only and once using electrode O2 only. Identify the corresponding best accuracy. Examine K from 1 to 30.
- For each of the 2 subjects, identify the value of K using Method 2 that achieve the best accuracy as evaluated by the leave-one-trial-out approach when combining electrodes O1 and O2. Identify the corresponding best accuracy. Suggest a method for the combination. Examine K from 1 to 30.

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- For Method 2, identify the value of K that achieves the best accuracy as evaluated by the leave-one-trial-out approach when combining the data of all electrodes. Identify the corresponding best accuracy. Suggest a method for the combination. Examine K from 1 to 30.

Submission:

- Your MATLAB or Python code to be submitted on Canvas by **July 21 at mid-night**
- A report (to be submitted on Canvas by **July 21 at mid-night**) that includes the following:
 - Description of the approach used
 - Outputs of the project as described in the deliverables
- Submission of the above items should be done as one .zip file by the deadline

Guidelines:

- This is a group project. A maximum of 3 students per group is allowed.
- Each team must send an e-mail by **Saturday, July 13 at mid-night** specifying the members of the team.
- **Changing teams will not be allowed.**
- Project evaluation will occur in the class of **July 22**.
- Project grading will be as follows (out of 15):
 - 5 points on the code submitted
 - 5 points on the submitted report
 - 5 points on the evaluation and discussion