

CSCE 363/3611 – Digital Signal Processing

Project

(Due on: May 21, 2025 at mid-night)
(Submit on Canvas as one .zip file)

Implement the approach explained in Slide 10 in the attached file “Attention State.pdf”. Data of 5 different subjects is provided. For each subject, you will find in the “Data” folder two .mat files (train_data_X.mat & test_data_X.mat, where X is the subject number) containing the following attributes:

- channels: Names of the EEG channels
- data (dimensions: number of trials \times number of samples \times number of channels): Each trial contains 15 seconds of EEG signals recorded from seven channels
- fs: Sampling rate
- labels (1D array): Labels for each trial: 0 for “Focused” and 1 for “Drowsy”

Deliverables:

- Your code
- For each of the 5 subjects, Identify the frequency band, channel, and value of K (for KNN), that yields the highest classification accuracy on test data. Report the highest accuracy achieved.
- Comment on the differences across subjects. Is there a difference in the best channel, frequency band, and value of K identified across subjects?
- Propose a method to combine all frequency bands for each individual channel. Comment on how using all bands affects classification performance per subject.
- Propose a method to combine all channels for each individual frequency band. Comment on how using all channels affects classification performance per subject.
- Propose a method to combine all frequency bands and all channels. Comment on how using all bands and all channels affects classification performance per subject.

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Submission:

- Your MATLAB or Python code to be submitted on Canvas by **May 21 at mid-night**
- A report (to be submitted on Canvas by **May 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 **Tuesday, April 29 at mid-night** specifying the members of the team.
- **Changing teams will not be allowed.**
- Project evaluation will occur in the class of **May 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