The American University in Cairo
Computer Science and Engineering Department
Fall 2024

CSCE 363/3611 – Digital Signal Processing

Project

(Due on: December 8, 2024 at mid-night)
(Submit on Canvas as one .zip file)

Implement the approach explained in the slides. Data of 3 different subjects is provided. For each subject, you will find a .mat file containing the following attributes:

- **subject**: subject number.
- **emg (10 columns)**: sEMG signal. Columns 1-8 are the electrodes equally spaced around the forearm at the height of the radio humeral joint. Columns 9 and 10 contain signals from the main activity spot of the muscles flexor and extensor digitorum superficialis.
- **stimulus (1 column)**: the movement repeated by the subject, according to the displayed movie.

The sampling rate of the data is 100Hz.

Deliverables:

- Your code
- Plot the spectrum of each of the first 3 channels for Subject 1 before and after applying the high-pass filter.
- Based on the plots, comment on the impact of the high-pass filter on the recorded data.
- For each of the 3 subjects, identify the channel, domain (time-domain vs frequency-domain) and value of K that achieve the highest leave-one-out classification accuracy. State the highest accuracy achieved in this case.
- Comment on the differences across subjects. Is there a difference in the best channel, domain and value of K identified across subjects?
- Suggest a way to combine the data from all channels.
- Comment on the impact of considering all channels on the performance of the system.

Submission:

- Your MATLAB or Python code to be submitted on Canvas by **December 8 at mid-night**
- A report (to be submitted on Canvas by **December 8 at mid-night**) that includes the following:
  - Description of the approach used
  - Outputs of the project as described in the deliverables

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- 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 **Sunday, November 17 at mid-night** specifying the members of the team.
- **Changing teams will not be allowed**.
- Project evaluation will occur in the class of **December 9.**
- 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