Ain Shams University
Faculty of Engineering
Computer & Systems Eng. Dept.



CSE 462 – Biomedical Engineering 2017-2018

## Assignment #2

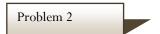
(Due on: Saturday, December 16 at mid-night by e-mail)



Implement the needle EMG decomposition algorithm given in Lecture 7.pdf. Your function should take as inputs the EMG signal to process and the moving average window size T mentioned on slides 14 and 17. The function should return a vector that contains the timestamps of the peaks of the detected MUAPs for each detected MU and a vector for the template of each MU. Apply your function to the EMG signal provided in the file "Data.txt" with T = 20 samples and DiffTh defined in slide 18 is set to  $12.65^5$ .

## Deliverables:

- Your code
- A figure showing from sample 30000 to sample 35000 of the EMG signal with an "\*" marking the detected MUAPs colored with different colors depending on the MU each MUAP belongs to (Similar to slide 19).
   Name the figure "DetectedMUAP.jpg"
- A figure showing the waveform of each template of the detected MUs (Similar to slide 20). Name the figure "Templates.jpg"



In this problem, you are going to use K-means clustering to identify the MUAPs belonging to each MU as explained on slides 21 to 26 of Lecture 7.pdf. You can use the kmeans function already implemented in MATLAB in your code. For the value of K, use the number of templates you obtained in Problem 1. The function should return a vector that contains the timestamps of the peaks of the detected MUAPs for each detected MU and a vector for the template of each MU. Use the same settings as Problem 1 (T = 20 samples).

## Deliverables:

- Your code
- A figure showing from sample 30000 to sample 35000 of the EMG signal with an "\*" marking the detected MUAPs colored with different colors depending on the MU each MUAP belongs to (Similar to slide 19).
   Name the figure "DetectedMUAP\_K.jpg"
- A figure showing the waveform of each template of the detected MUs (Similar to slide 20). Name the figure "Templates\_K.jpg"

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