PROJECT | MCT4338/MCTE4314

P1- Part 1: DISCRETE SYSTEM – MOVING AVERAGE FILTER

Load bostemp into your matlab and you should be able to see tempC on your workspace. The data was gathered for 31 days. Plot the x-axis in number of days [Hint: days=(1:31*24)/24;].

a) Using Matlab build in function called 'filter', **obtain** a 24-point moving average filter on tempC. **Plot** the original data and the filtered data in one plot

b) **Perform** a 50-point moving average filter using convolution. **Plot** both graph of tempC and yfilter in one plot. **Analyse** and **explain** why the length of yfilter is 793. **Provide** a solution on how to modify the results of yfilter to fit the original data tempC

[Hint: The impulse response of the length 50-point MAF is given as $h(n) = \frac{1}{50}\,(u(n) - u(n\,-\,50))$

P1- Part 2: NOTES FREQUENCY EXTRACTION

Download the three files 'tone1.wav', 'tone2.wav' and 'tone3.wav'. Using any programming tools, **plot** and **determine** the frequency of each tone by demonstrating the use of fft. Show and **explain** your code.

P2 - Part 3: SPEAKER RECOGNITION

Considering there are 5 workers in the office. You are required to design a biometric security system that will only allow the 5 workers to enter the office. Write a code that could recognize who is speaking using the method of Euclidean distance (score distance) of their speech magnitude spectrum.

- Obtain 5 recordings of your friends saying the phrase "The quick brown fox jumps over the lazy dog", 6 times. Save each recordings as .wav. (e.g., Ahmad1.wav, Ahmad2.wav, … , Ahmad6.wav).
- Save the first 5 recordings for each person as your database. The 6th recordings will be labelled as unknown. (In total, 25 recordings as training and 5 recordings as unknown).
- Obtain the magnitude spectrum for all recordings. Process the signal with these parameters:
  - Tframes = 0.020; %20ms
  - NFFT = 1000;
- Represent your result in a table form (fill in the score distance) :

	P1	P2	….	P5
U1 (P1_6)				
U2 (p2_6)				
….				
U5 (P5_6)				

- You may use other distance measures. However, you must demonstrate the use of FFT for this part.
- **Explain** the codes that you have written and **write** a report on your observation/result. How many **percentage** was the speaker accurately identified?

*You may use audacity (download at https://www.audacityteam.org/download/) to record and edit the recordings.

P2-Part 4: Load the two signals (signal1.mat and signal2.mat). Plot the two signals in frequency domain. For each signal, determine their frequencies and the range of frequencies of the noise. Design a filter to remove the noise.

- Provide the frequencies of the signal
- Provide the approximate range of frequencies of the noise
- Provide the parameters used for the designed filter (for example, if you use low-pass, provide the passband frequency and stopband frequency)
- Plot the original signal and the filtered signal in frequency domain

Submission Procedure

Submission in groups of two (2) (only one person needs to submit and make sure to write both names in the cover page). Submission will be done through google classroom **by latest 3rd January, Sunday at 11.59PM on google classroom**. Include all your codes, graphs, tables etc. in your report. You are required to **submit your report in pdf**. Late submission will not be entertained.