**­­­BME 384 - Spring 2024**

**In-Class Final Assignment**

This assignment is to be completed individually using Matlab, and it is equivalent to one lab report grade. Once completed or by 11 am, you are expected to upload the script to the submission on Canvas. You are allowed to reference your previous scripts or reports. To assess whether your code functions correctly, we will download and run your script. Please be sure to comment your code!

On Canvas, you have been given a CSV file with the X, Y, and Z coordinates of a marker on the index fingertip, as well as a MAT file that contains EMG of a finger muscle and pinch force data (EMGdata and Forcedata) during grasping and lifting a small object from the desk. The grasp\_and\_lift movement was repeated 5 times, and the data collection lasted 10 seconds. Data collection for all three variables (EMGdata, Forcedata, [X, Y, Z]) started simultaneously. The sampling rate for EMG was 1000 Hz, for pinch force 10 Hz, and 120 Hz for X, Y and Z coordinates. Please complete the following tasks:

1. Load both types of data sets (.csv and .mat) into Matlab. (15 Points)
2. Plot the X and Z coordinate data over time using the CSV data. (15 Points)
3. Perform operations required to plot force and EMG data on the same timescale as the X coordinate data (i.e., convert force and EMG data vectors to the same size as Optitrack data)*.* (40 Points)
4. Plot the force, EMG, and X coordinate over time on the same plot. If you could not finish item 3, plot these three variables on a figure with three subplots. (15 Points)
5. Estimate timing differences between the onsets of EMG activity and force. (15 points)

**Bonus**

* Use the function yyaxis to create the left Y axis for the force and EMG, and the right Y axis for the X coordinate. Add appropriate labels to the left and right Y axes: Pinch Force (N) and EMG, and X (m). Add a title to the plot that would list all three variables. (15 points)

* Animate the Optitrack data as we have done before. Be sure to identify the marker with a visible point. (10 points)