**Prerequisites:**

Install the TOMLAB/SNOPT toolbox: [LINK](https://tomopt.com/tomlab/products/snopt/)

Within the installation folder, open the following script:

1. Startup.m

**Project Files (Matlab Scripts and Models):**

1. AllMuscleParams.m
2. ElbowMusculoSkeletalModel.slx
3. MSOptimizerMultipleCombined.m
4. MSOptimizerMultipleFreeTf.m

**Steps to run our project:**

Step 1. Ensure the above MATLAB scripts and models are copied into the TOMLAB/SNOPT installation folder.

Step 2: Run Startup.m  
*This step will ensure that the optimization functions required to run SNOPT are compiled and ready to use*

Step 3: Run AllMuscleParams.m script  
*This step initializes all the constants that are required to run the musculoskeletal model. The initial and final elbow positions are specified by ThetInit and ThetaFin.*

Step 4: Run the ElbowMusculoSkeletalModel.slx Simulink model   
*This step uses the constants and muscle parameters initialized in the previous step to obtain the step response for a known control input (STIM).*

Step 5: a) For QR optimization study, run the MSOptimizerMultipleCombined.m script; b) For free final time optimization study, run MSOptimizerMultipleFreeTf.m script  
*A) MSOptimizerMultipleCombined.m runs optimization to obtain the STIM profile required to produce an elbow flexion movement from ThetaInit to ThetaFin. The cost function is provided by J. In the provided code, the Optimizer runs 4 variations with combinations of Q (state cost) and R (control cost).*

*B) MSOptimizerMultipleFreeTf.m runs an optimization to obtain the control (STIM) profile to reach a target elbow flexion position in the least time. Cost function is specified to be Tf (Final time itself).*