EE4820: Biomedical Signal Processing
The DTFT and DFT, zeropadding

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Due: Mon 3/7

1. Semmlow P3.5
2. Semmlow P3.13
3. Semmlow P3.14
4. *Extra problem for **AFTER** completing Semmlow problems*

   - The signal stored in **x_fftlab.mat** is a discrete-time signal $x[k]$ which was sampled at a sampling rate of $f_s = 3$kHz.
   - Use the *fft* command to approximate the discrete-time signal spectrum $X(e^{j\omega})$. Compute the signal's fft three times, using a different number of points each time:
     (a) $N_{fft} = 32$
     (b) $N_{fft} = 128$
     (c) $N_{fft} = 512$

     Plot each magnitude spectrum versus frequency in Hz.
   - Predict what signal this is. Based on the DFT $X[i]$ you computed, what would you estimate the fundamental frequency of $x[k]$ to be?
   - Now, based on your guess of what function $x[n]$ is, find the actual frequency spectrum of $x[n]$. Plot $X(e^{j\omega})$ versus frequency in Hz.
   - What effect does increasing N_{fft} have on the DFT of $x[k]$? Use your figures to support your answer.
   - *Now*, you may plot $x[t_k]$. Does this match your prediction?