EXAMPLES: SPECTRA OF ACTUAL SIGNALS

Given: $\{x(t), 0 \le t < T\}$ sampled at $t = n\Delta \rightarrow x[n] = x(t = n\Delta)$.
Goal: Estimate the spectrum of $x(t)$ from the data set $\{x[n], 0 \le n \le N-1\}$.

1. Take *periodic extension* of given $\{x(t), 0 \le t < T\}$.
2. Spectrum of $x(t = n\Delta)$ periodic with period $\frac{2\pi}{\Delta}\frac{\text{RAD}}{\text{SEC}} = \frac{1}{\Delta}$ Hz
3. Have $N = T/\Delta$ samples of $x(t)$. Assume $\Delta < \frac{1}{2F} \rightarrow \underline{N > 2FT}$ where F=the maximum frequency component of $x(t)$.
4. $x(n\Delta)$ and its spectrum both periodic→compute DFT of $x[n]$.

1. Two built-in Matlab signals. Use 1-second segments ($T = 1$).
2. Sampling rate=8192 Hz→ $\Delta = 1/8192$ sec→ $N = 1/\frac{1}{8192} = 8192$.
3. Assume $\Delta < \frac{1}{2F}$. The Matlab code for each signal looks like:
4. **load train;X=y(1:8192);plot(-4095:4096,fftshift(abs(fft(X))))**