

# Signals, Sampling & Filtering

Paul Gribble  
Nov 12, 2019

## Representation of Signals (Time vs Frequency Domain)

- amplitude / frequency / phase
- Fourier series representation of signals & the FFT

## Sampling

- the nyquist frequency
- aliasing

## Power Spectrum

- pure sinusoid vs noisy sinusoid
- power spectral density (PSD)—`pwelch()`
- spectrogram (spectrum over time)

## Filtering

- cutoff or corner frequency
- pass band, stop band, rolloff
- smoothing signals before taking derivatives
- choosing the cutoff frequency of a lowpass filter

## Quantization

- bits & input range of your A/D board
- e.g. 12-bit A/D board with a +/- 5 volt input range.
- 4096 values spread across 10 volts (-5 -> + 5)
- signal clipping

## Filtering

- built-in lowpass vs PLGlowpass, just use PLGlowpass
- lowpass demo: 3 Hz sinusoid plus `randn()` noise, lowpass at 10 Hz