Homework 5

Autocorrelogram and Power Spectra

- Q1 (5 points): Write a function that generates T seconds of an oscillatory spike train of frequency F and jitter J (uniformly distributed). Generate and plot 1 sec of a 30 Hz train with 3 ms jitter.

- Q2 (5 points): Write a function that takes a spike train and a bin size, and return the autocorrelogram (see class notes).
Generate a 20 sec long train of a 30 Hz oscillation with 2 ms jitter. Compute and plot the autocorrelogram of the train (1ms bins) for time lags up to 500 ms.
What do you see?

- Q3 (5 points): Turn the spike train into an array of 0 and 1's (no spikes, spikes) with 2 ms resolution. Use the *pwelch()* Matlab function and plot its Power Spectrum.

(Optional, 5 points)
- Generate a 20 sec long 40 Hz Poisson train with 1 ms refractory period. Compute and plot the autocorrelogram and power spectrum as above. What do you obtain?
- Merge the two trains above to get a new 20 sec long spike train. Compute and plot the autocorrelogram and power spectrum as above. How do these plots compare with the plots above? Plot and comment the ISI return map of this train.