We will be working with a synthetic dataset of 100 neurons and 1 LFP. The LFP is generated as an AR(2) model for gamma oscillations, and the spikes are generated according to an inhomogeneous Poisson process. The data consists of 100 neurons that have variable spike counts.

Throughout the tutorial you should complete some code where I have entered ?\_do\_?

**1) (See Code PART 1): Inspect data**

* Convert the dataspike structure to the spike structure using ft\_checkdata. You should be able to understand the difference between both representation.
* If you are not familiar with the spike structure, then inspect the continuous representation (e.g. for Neuron 2 in Trial 1) with the representation of the spikes as lists of times.

**2) (See Code PART 2): Extract the phase for each spike.**

* Examine the sts structure and compare to the spike structure. Which field is present in the sts structure that is not present in the spike structure? How is this field organized?
* What does each element in this array represent?
* You should be able to explain how you can gauge the phase for each spike, and the amplitude of the LFP when the spike occurred.

**3) (See Code PART 3): Compute PPC**

* Compute PPC values for each neuron using ft\_spiketriggeredspectrum\_stat and using "ppc1" method

**4) (See Code PART 4): Compute the spiketriggered average for all neurons.**

* For this function, FieldTrip uses the continuous spiking format
* Visualize the spike triggered average for all neurons
* You should be able to see sidelobes in the STA indicating the rhythmic structure of the LFP

**5) (See Code PART 5): Visualize statistics for each neuron.**

* You will add a single neuron statistic (rayleigh test) and the resultant vector length (plv).
* You should visualize the histogram of angles
* Try to see how the number of spikes determines the different measures: the significance from the Rayleigh test, the variance of the PPC spectrum, and the value of the resultant vector length.

**6) (See Code PART 6): Compute the group average for all neurons**

* Compare the weighted, unweighted, and thresholded average. You should be able to understand why the unweighted average looks quite variable.

**7) (See Code PART 7): Spike-triggered average using Fourier**

Here we compute the spectrum around each spike with an FFT with a fixed window, which is implemented through ft\_spiketriggeredspectrum\_fft

**8) (See Code PART 8): Compute the spike-field coherence for all neurons**