

## MA666 Spectra Homework

1. Load the file:

**EEG-a.mat**, available on the [GitHub repository](#) into Python.

- a. What is the sampling interval ( $\Delta$ )?  
What is the total duration of the recording (T)?  
What is the frequency resolution (df)?  
What is the Nyquist frequency ( $f_{NQ}$ )?
  - b. **Plot the data** and visually inspect it. Describe briefly (in a sentence or two) what rhythms - if any - you see in the data.
  - c. **Plot the spectrum** versus frequency. Choose to plot the spectrum on a decibel scale, or not, and with a logarithmic frequency axis, or not.
  - d. **Plot the spectrogram** as a function of frequency and time. You will need to choose the interval size and the overlap between intervals. Do the rhythms in these data appear to change in time?
  - e. **Interpret** (in a few sentences) the spectrum and spectrogram, and describe the rhythms present in the signal. Compare your visual inspection of the data to the spectrum results - do the analyses agree or disagree?
2. Repeat Question (1) for the data **EEG-b.mat**. Address each sub-question (a-e).
3. Repeat Question (1) for the data **EEG-c.mat**. Address each sub-question (a-e).
4. Repeat Question (1) for the **spike train** in **spikes-a.mat**. Address each sub-question (a-e).
5. Repeat Question (1) for the **spike train** in **spikes-b.mat**. Address each sub-question (a-e).