**Computer challenges for the power spectrum.**

1. Load the file:  
   **EEG-2.mat**, available on the [Github repository](https://github.com/Mark-Kramer/Case-Studies-Python/tree/master/Analysis%20of%20Rhythmic%20Activity%20in%20the%20Scalp%20EEG) into Python.
   1. What is the sampling interval ()? What is the total duration of the recording (T)? What is the frequency resolution (df)? What is the Nyquist frequency (fNQ)?
   2. Plot the data and visually inspect it. Describe briefly (in a sentence or two) what rhythms - if any - you see in the data.
   3. Plot the biased autocorrelation versus lags. You will need to choose the maximum number of lags to investigate. What structure do you observe in the autocorrelation, if any?
   4. Plot the spectrum versus frequency. You may choose to plot the spectrum on a decibel scale, or not. Defend your choice!
   5. 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?
   6. Interpret (in a few sentences) the autocorrelation and spectrum, and describe the rhythms present in the signal. Compare your visual inspection of the data to the autocorrelation and spectrum results - do the analyses agree or disagree?
2. Repeat Question (1) for the data set **EEG-3.mat**. Be sure to address each sub-question (a-f).
3. Repeat Question (1) for the data set **EEG-4.mat**. Be sure to address each sub-question (a-f).
4. Repeat Question (1) for the data set **EEG-5.mat**. Be sure to address each sub-question (a-f).
5. Consider the function x(t) = sin(2 pi t2). Simulate this function in Python using a sampling interval of dt = 0.001 ms, and t = (0, 10) s. Analyze these data as you would an EEG time series collected in an experiment. Compute the spectrum, and compute the spectrogram. Explain the results you find in each case, and how these results compare to your expectations.