ASSIGNMENT 3 (due 26.10.2021)

1. FIGURE(1).
Create a family of Morlet wavelets ranging in frequency from 2 Hz to 30 Hz in five steps.
Select one electrode from the scalp EEG dataset and convolve each wavelet with EEG data
from all trials from that electrode. Apply the Matlab function real to the convolution result, as in
convol_results = real(convol_results)
This will return the EEG data band-pass pass filtered at the peak frequency of the wavelet.
Average the result of convolution over all trials and plot an ERP corresponding to each
wavelet frequency. Each frequency should be in its own subplot (5 subplots).
Plot the broadband ERP (without any convolution). Thus, you will have six subplots in one
figure. How do the wavelet-convolved ERPs compare with the broadband ERP? Are there
dynamics revealed by the wavelet-convolved ERPs that are not apparent in the broadband
ERP, and are there dynamics in the broadband ERP that are not apparent in the
wavelet-convolved convolved ERPs? Base your answer on qualitative visual inspection of the
results; statistics or other quantitative comparisons are not necessary.
3 points

2. FIGURE(2)
Convolve each wavelet with EEG data from all channels and from one trial.
Extract power and phase from the result of complex wavelet convolution and store in a time x
frequency x electrodes x power/phase matrix (thus, a 640 x 5 x 64 x 2 matrix).
Make topographical plots of power and phase at 180 ms at all frequencies (hint: you may
need to use the squeeze function to remove singleton dimensions). Arrange the plots in one
figure with five columns for frequency and two rows for power/phase. Put labels in the plot so it
is clear which topographical maps correspond to which frequencies.
3 points

3. FIGURE(3)(Optional)
Repeat step 4 for activity at 360 ms. 6. Are there any prominent topographical
features in power or in phase? Do these differ for different frequencies? Do power and phase
have similar topographical distributions? Is there any reason to suspect that they might have
similar or different topographies?
2 points