**Homework ERP. Due Oct 24, 2019.**

1. Load the file:  
   **EEG-2.mat**, available on the class [Github repository](https://github.com/Mark-Kramer/BU-MA665-MA666/tree/master/Topic-4%20The%20evoked%20response%20potential) into Python. You’ll find two variables:  
   EEG = the EEG data, consisting of 1,000 trials, each observed for 1 s;  
   t = the time axis, which ranges from 0 s to 1 s.  
   These data have a similar structure to the data studied in class. To collect these data, a stimulus was presented to the subject at 0.25 s. Analyze these data for the presence of an evoked response. To do so, answer the following questions:
   1. What is the time between samples (dt) in seconds?
   2. Examine these data. Explain what you observe in pictures and words. From your visual inspection, do you expect to find an ERP in these data?
   3. Compute the ERP for these data, and plot the results. Do you observe an ERP (i.e., times at which the 95% confidence intervals do not include zero)? Include 95% confidence intervals in your ERP plot, and label the axes. Explain in a few sentences the results of your analysis, as you would to a collaborator who collected these data.
2. Load the file:  
   **EEG-3.mat**, available on the class [Github repository](https://github.com/Mark-Kramer/BU-MA665-MA666/tree/master/Topic-4%20The%20evoked%20response%20potential) into Python. You’ll find two variables:  
   EEG = the EEG data, consisting of 1,000 trials, each observed for 1 s;  
   t = the time axis, which ranges from 0 s to 1 s.  
   These data have a similar structure to the data studied in class. To collect these data, a stimulus was presented to the subject at 0.25 s. Analyze these data for the presence of an evoked response. To do so, answer the following questions:
   1. What is the time between samples (dt) in seconds?
   2. Examine these data. Explain what you observe in pictures and words. From your visual inspection, do you expect to find an ERP in these data?
   3. Compute the ERP for these data, and plot the results. Do you observe an ERP (i.e., times at which the 95% confidence intervals do not include zero)? Include 95% confidence intervals in your ERP plot, and label the axes. Explain in a few sentences the results of your analysis, as you would to a collaborator who collected these data.
3. Load the file:  
   **EEG-4.mat**, available on the class [Github repository](https://github.com/Mark-Kramer/BU-MA665-MA666/tree/master/Topic-4%20The%20evoked%20response%20potential) into Python. You’ll find two variables:  
   EEG = the EEG data, consisting of 1,000 trials, each observed for 1 s;  
   t = the time axis, which ranges from 0 s to 1 s.  
   These data have a similar structure to the data studied in class. To collect these data, a stimulus was presented to the subject at 0.25 s. Analyze these data for the presence of an evoked response. To do so, answer the following questions:
   1. What is the time between samples (dt) in seconds?
   2. Examine these data. Explain what you observe in pictures and words. From your visual inspection, do you expect to find an ERP in these data?
   3. Compute the ERP for these data, and plot the results. Do you observe an ERP (i.e., times at which the 95% confidence intervals do not include zero)? Include 95% confidence intervals in your ERP plot, and label the axes. Explain in a few sentences the results of your analysis, as you would to a collaborator who collected these data.
4. In the previous question, you considered the dataset **EEG-4.mat** and analyzed these data for the presence of an ERP. To do so, you (presumably) averaged the EEG data across trials. The results may have surprised you . . . Modify your analysis of these data (in some way) to better illustrate the appearance (or lack thereof) of an evoked response. Explain “what's happening” in these data as you would to a colleague or experimental collaborator.
5. Compare the datasets **EEG-3.mat** and **EEG-4.mat** studied in the previous problems. Use a bootstrap procedure to test the hypothesis that the evoked response is significantly different in the two datasets.