

Handed out: **June 24, 2019**

Due: **June 28, 2019 at 5PM**

Submit your report electronically as a pdf file to Rosemary (rbusta@uci.edu) and to Babak (babaks@uci.edu)

LATE EXAMS WILL NOT BE ACCEPTED

Background There is an immense interest in pre-hospital diagnostic of stroke in order to enable rapid acquisition in the acute care setting upon arrival. Currently, the standard clinical practice is to use Rapid Arterial Occlusion Evaluation (RACE) score to decide whether a patient had stroke or not. Recent studies have shown that some additional clinical variables along with the Electroencephalography (EEG) changes immediately after brain ischemia can be used to identify patients with acute stroke. As an initial step, in this study we examined patients admitted to the Emergency Department at a local hospital. The clinical variables considered in our study are RACE score, Last Known Well (LKW) time in hours, Gender, and Age. Those with suspected stroke underwent a 3 min EEG using a wireless dry-electrode system. We measured 100 EEG signals, which are denoted as E1 to E100 and referred to as *EEG variables* to distinguish them from the *clinical variables* (RACE, LKW, Gender, and Age). The outcome of interest is a binary variable called Stroke, which is set to 1 if the patient did in fact had a stroke based on thorough follow-up exams.

<https://www.ics.uci.edu/~babaks/da2019.html>

Objectives of Data Analysis

Using the observed data (DA2019.csv), perform the following analyses:

- (A) Examine the association between RACE and Stroke given all other clinical variables (do not include the EEG variables in this analysis).
- (B) It has further been hypothesized that the association between RACE and stroke stroke varies by age. Conduct an appropriate analysis to assess this hypothesis (do not include the EEG variables in this analysis).
- (C) Using both EEG and clinical variables, build a model for pre-hospital stroke prediction. Evaluate the performance of your model and compare it to a simpler model that uses the clinical variables only (i.e., excluding the EEG variables). For this part, you can use frequentist or Bayesian methods. Either way, you need to justify your approach and your evaluation criteria.

General Instructions

You are to analyze the data to best address the above scientific questions of interest. You should properly justify your model and use appropriate statistical methods for estimating and quantifying uncertainty in associations. When discussing your results, you should distinguish between statistical importance and practical importance.

Your final analysis should be presented in the form of a brief report (no more than 10 pages including relevant tables and figures). A font size of 11 points or larger must be used. Margins in all directions must be at least an inch. You may place additional information (eg. diagnostic plots) in an appendix if you feel it necessary; however, the appendix should be readable: **do not copy-paste your computer code and output**. The report should (at minimum) consist of the following sections:

1. Abstract - A brief summary of your basic findings
2. Introduction - A brief introduction/motivation to the problem at hand and what is to be addressed
3. Statistical Methods - A discussion and justification of the methods you have used to analyze the data and how you went about analyzing the data
4. Results - A presentation of the results of your analysis
5. Discussion - A synopsis of your findings and any limitations your study may suffer from

Your report should be succinct and to the point! It should be written in a language that is understandable to the scientific community. You may use tables, plots and figures to help explain your findings. You may use any written references for this problem that you wish.

You cannot talk to anyone about your analysis. If you need clarification about anything you may ask Babak, but only before June 26. Please type at the beginning of your exam: ***I spoke with no-one concerning this exam except for a faculty member*** and then type the last four digits of your student ID.