Syllabus

CLRE 254 – BIOSTATISTICS II, 2 UNITS

Spring 2022

Course instructor
Florin Vaida, PhD, fyaida@ucsd.edu

Course TA
Rishi Deka rdeka@ucsd.edu; Office hours: by request

Course Description
This course gives you the skills to understand and conduct advanced biostatistical analyses including multiple linear regression, logistic regression, and Cox regression. You will become familiar with adjusted and unadjusted analyses of continuous (scalar), binary, and time-to-event outcome variables. The causal approach for multi-predictor models will be emphasized, and practical model building strategies will be discussed. Models with additive and interactive effects of predictors will be introduced. We will identify common violations of model assumptions and how to address them. Data analyses will be conducted in R/Rstudio. This course is a pre-requisite for taking elective stat courses.

Course Organization
Two 50-minute sessions per week. Case studies will be introduced and discussed for each key statistical method. We will also conduct interactive data analysis sessions using R. Students will work in small groups and individually.

Course Goals
Provide the knowledge, tools, and practical experience for the workhorses of advanced statistics needed to analyze cross-sectional observational studies and randomized clinical trials.

Course Objectives
1. Develop a conceptual understanding of common statistical methods appropriate for biomedical data, including linear regression, logistic regression, and survival analysis methods. Understand and know how to apply model building and model selection.
2. Develop the ability to read critically and understand the aspects of study design and statistical analysis from the scientific biomedical literature.
3. Develop facility with examining and analyzing biomedical datasets using appropriate statistical methods, in R/Rstudio.

Prerequisites and Preparation
Biostatistics I or equivalent.

Course Materials/Resources – Required and Recommended
- Other Materials: Detailed course notes are provided
- Computer software: R and Rstudio will be used in class, for homework, and for the final exam.
- Online resources: https://canvas.ucsd.edu. Extensive resources on R are available online.
Course Schedule

<table>
<thead>
<tr>
<th>Lect</th>
<th>Date</th>
<th>Topic</th>
<th>Reading</th>
<th>Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1</td>
<td>Mar 31</td>
<td>Linear regression: single predictor</td>
<td>RMB 4.1-4.3</td>
<td></td>
</tr>
<tr>
<td>L2</td>
<td>Apr 7</td>
<td>Linear regression: multiple predictors</td>
<td>RMB 4.4-4.6</td>
<td>Hw1 due</td>
</tr>
<tr>
<td>L3</td>
<td>Apr 14</td>
<td>Checking linear model assumptions</td>
<td>RMB 4.7-4.8</td>
<td></td>
</tr>
<tr>
<td>L4</td>
<td>Apr 21</td>
<td>Causal inference and model building</td>
<td>RMB 9.2, 10.2</td>
<td>Hw3 due</td>
</tr>
<tr>
<td>L5</td>
<td>Apr 28</td>
<td>Logistic regression</td>
<td>RMB 5.1, 5.2</td>
<td>Hw4 due</td>
</tr>
<tr>
<td>L6</td>
<td>May 5</td>
<td>Logistic regression</td>
<td>RMB 5.3-5.7</td>
<td></td>
</tr>
<tr>
<td>L7</td>
<td>May 12</td>
<td>Predictive modeling</td>
<td>RMB 10.1, 10.3, 5.2</td>
<td>Hw6 due</td>
</tr>
<tr>
<td>L8</td>
<td>May 19</td>
<td>Survival analysis</td>
<td>RMB 3.5, 6.1, 6.2</td>
<td>Hw7 due</td>
</tr>
<tr>
<td>L9</td>
<td>May 26</td>
<td>Survival analysis: Cox model extensions</td>
<td>RMB 6.2-6.5</td>
<td>Hw8 due</td>
</tr>
<tr>
<td>L10</td>
<td>Jun 2</td>
<td>Recapitulation</td>
<td></td>
<td>Hw9 due</td>
</tr>
<tr>
<td>Final</td>
<td>Jun 9</td>
<td>Final Exam</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Course Components

- Weekly assignments, to be submitted through Canvas.
- Homework is due at 11:59pm, on the following Thursday. Late homework is not acceptable.
- The only acceptable format is .pdf. Do not submit raw R output.
- One homework submission for a group of two students. Groups are assigned by instructor via Canvas, and changed once during the quarter.

Final Exam

- 3h exam over the internet, 11th week of the course. The exam will involve data analysis in R, and/or hand calculations.
- A make-up exam date will be set up for students with extenuating circumstances. The student should make arrangements with the instructor in advance (at least two weeks if possible).
- The best tool for preparing the final exam is practice on the prior final exams, posted on course website.

Grading Policy

- The course grade will have two components: Homework (40%) and Final exam (60%).
- All students receive a final grade bonus of 0-2 percentage points, based on completed evaluation by the class as a whole (0% = 0 points, 100% = 2 points, with linear interpolation in-between).
- Plagiarism will be dealt with according to the UCSD Policy of Integrity of Scholarship.
- See your grades on Canvas canvas.ucsd.edu (if you are matriculated- in MAS Program), or on MyExtension https://myextension.ucsd.edu/ (if you are non-matriculated/CREST, concurrent enrollment).

Grade thresholds use the UCSD grading scheme:

<table>
<thead>
<tr>
<th>Grade</th>
<th>Total Score</th>
<th>Grade</th>
<th>Total Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>94-100</td>
<td>C+</td>
<td>77-79.9</td>
</tr>
<tr>
<td>A-</td>
<td>90-93.9</td>
<td>C</td>
<td>74-76.9</td>
</tr>
<tr>
<td>B+</td>
<td>87-89.9</td>
<td>C-</td>
<td>70-73.9</td>
</tr>
<tr>
<td>B</td>
<td>84-86.9</td>
<td>D-/D/D+</td>
<td>≥61/64/67</td>
</tr>
<tr>
<td>B-</td>
<td>80-83.9</td>
<td>F</td>
<td>0-60.9</td>
</tr>
</tbody>
</table>
Course Policy and Expectations (classroom rules of conduct)

- Time Commitment: Expect to spend 4-6 hours a week outside of class.
- Attendance Policy: The general CREST attendance policy applies, no more than 3 missed sessions are allowed. You have to be present in both halves of the class.
  Note: this policy is suspended during COVID-related remote learning. The students not present at class time are expected to review the video lectures asynchronously.
- Academic Integrity (Plagiarism): http://academicintegrity.ucsd.edu/
- Late homework is not acceptable.

Communication with lecturer and teaching assistant
The best way to reach us is via email. We will respond within 24 hours under usual circumstances.

Student Evaluation of Course and Faculty
Course and faculty evaluations provide important feedback to instructors to improve course content and teaching methodology. The evaluations are also an important factor in faculty advancement. A link to one-time course evaluations will be made available via Canvas. All students will receive a final grade bonus of 0-2 percentage points, based on evaluation completion by the class as a whole (0% = 0 points, 100% = 2 points, with linear interpolation in-between).

Technical Requirements
The students should bring their laptop with R and Rstudio installed to every class, and conduct analyses at the same time with the instructor.

Accommodations: If you have a disability that may impact your academic performance, you may request accommodations by submitting documentation to: https://students.ucsd.edu/well-being/disability-services/