

MATH 6397 - BIOMEDICAL MODELING COMPUTING

Spring 2018

Instructor: Andrey Skripnikov	Time: TuTh 2:30PM - 4:00PM
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Office Hours: Room PGH 214, M 1:00-3:00PM, TuTh 1:00-2:30PM, or by appointment. Most communication and announcements will be posted via *UH Blackboard*.

Main References: The course will be revolving around the following book:

- Ding-Geng (Din) Chen, Karl E. Peace, Pinggao Zhang, *Clinical Trial Data Analysis Using R and SAS, Second Edition*, 2017.

Objectives: Course will deal with a select variety of statistical methodologies used in medical research. Just to name a few - survival analysis, longitudinal data modeling, logistic regression, sample size calculation, analysis of DNA microarray data. It won't be overly heavy on medical terminology, predominantly focusing on description of main ideas and applications for most ubiquitous statistical techniques and models. Course may come in handy for both the math/statistics/engineering students in order to acquaint themselves with medical applications, and for biology/chemistry students to better understand the statistical approaches used in medical research. The main software used throughout the course will be *R Statistical Computing language*, for which there will be a brief introduction during the first couple of lectures. All-in-all, at the end of the course, a successful student should:

- have a conceptual grasp of most popular statistical techniques used in medical research problems
- be able to use *R statistical programming* as a tool for conducting research and data analysis
- feel relatively comfortable when given a data file and asked to carry out particular analysis (be it comparison of medical treatments or performing logistic regression, among others)

Prerequisites (more like encouragements): Being familiar with at least one programming language. An undergraduate-level understanding of probability, statistics, calculus and linear algebra is assumed.

Software: Make sure to download *R* and *RStudio* (which can't be installed without *R*) before the course starts. Use the link <https://www.rstudio.com/products/rstudio/download/> to download it from the mirror appropriate for your platform. Let me know via email in case you encounter difficulties.

Tentative Course Outline:

- █ Introduction to R programming
- █ Treatment comparison in clinical trials (*t*-test, ANOVA, χ^2 -test,...)
- █ Treatment comparison in clinical trials with covariates (ANCOVA, logistic & poisson regression)
- █ Survival analysis, or dealing with *time-to-event* data
- █ Longitudinal data analysis
- █ Sample size determination and power calculations
- █ Meta-analysis for clinical trials (fixed- & random-effects model)
- █ Bioequivalence clinical trials (building confidence intervals)
- █ Analysis of DNA microarray data

Grading Policy: Attendance and participation - 10%, Homework - 30%, Midterm - 30%, Final (or Project, yet to be decided) - 30%.


Course Policy:

- Use of laptops during the class is encouraged solely for the purpose of practicing your *R* programming skills. Refrain from using your laptop for anything else.
- There will be bi-weekly homework. Late homework will warrant a $d \times 25\%$ penalty (subtracting $d \times 25\%$ of full possible points from your actual score), where d - number of days past due.
- Homework solutions must be typeset in a form of a report (using \LaTeX or *Word*).
- Most outstanding work may be considered for demonstration to the rest of the class as an exemplary standard, upon student's permission (with implied bonus mark for the student).
- All homework solutions must be submitted in class.
- You may discuss homework problems with other students, but you must write up your homework independently in your own words.
- By default, all exams (midterms and final) are closed book, and you are not allowed to use any electronic devices such as mobiles and tablets.

Class Policy:

- Homeworks, solutions and other announcements will be posted on *UH Blackboard*.
- Regular attendance is essential and expected. A student who incurs an excessive number of absences may be withdrawn from the class at the instructor's discretion.
- Be courteous when using mobile devices. Make sure your cell phone is turned fully off, or silent.

Academic Honesty: Lack of knowledge of the academic honesty policy is not a reasonable explanation for a violation. Questions related to course assignments and the academic honesty policy should be directed to the instructor.

 I certainly impose a sanction on the student committed to any academic fraud. It varies depending upon the instructor's evaluation of the nature and gravity of the offense. Possible sanctions include but are not limited to, the following: (1) Require the student to redo the assignment; (2) Require the student to complete another assignment; (3) Assign a grade of **zero** to the assignment; (4) Assign a final grade of **zero** for the whole course.

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