

Biost 562: Computational Skills for Biostatistics II

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Office Hours: Tuesdays 5:00pm – 6:00pm, Health Sciences Building F653.

Class Hours and Location: Thursdays 2:00pm – 3:20pm, Health Sciences Building T739.

Class Website: Syllabus, code, and assignments will be available at:

<https://canvas.uw.edu/courses/1123644>

Prerequisites: Biost 561, Computational Skills for Biostatistics I.

Course Description

This course covers a selection of advanced topics on statistical computing. Most research statisticians use the R language to implement their projects, or at least an initial version of them. We will then cover advanced general-purpose tools that will make you a better R programmer. Despite the many advantages of R, there are a number of operations for which it is slow or it uses a lot of computer memory. We will explore techniques for detecting performance bottlenecks, and we will cover basic C/C++ programming to speed up slow R functions.

Learning Objectives

Upon successful completion of this course you should be able to:

- Manipulate complex data structures, environments, functions, classes, and expressions in R.
- Use regular expressions in R for handling text/strings.
- Debug, profile, and optimize your R code.
- Speed-up your computations with C/C++ and parallel processing.

Class Schedule

This is a tentative schedule for the course. The specific topics might move around depending on how much progress we make in each lecture.

	Date	Topics
1.	Jan 4	Data structures, subsetting
2.	Jan 11	Environments, functions
3.	Jan 18	Functional programming
4.	Jan 25	Expressions, regular expressions
5.	Feb 1	S3 and S4 classes
6.	Feb 8	Debugging, profiling
7.	Feb 15	Memory management
8.	Feb 22	C/C++
9.	Mar 1	C/C++
10.	Mar 8	Parallel computing

Course Materials

Each session will have associated an R script containing the code covered in class, along with explanations. The scripts will have links to the sources from which the contents are drawn. We will use a variety of sources, most of which are available online. A large portion of the sessions will draw from the online book “Advanced R” by Hadley Wickham, available at:

<http://adv-r.had.co.nz/>.

There also exists a printed version of this book:

Wickham, Hadley (2014). *Advanced R*. CRC Press: Boca Raton, FL.

A lot of this book’s contents were covered in Biost 561, so we will focus on the remaining parts.

Grading

Weekly homework assignments.

- When are they distributed? Each Thursday after class.
- When are they due? The following Wednesday by 6:00pm via email to msadinle@uw.edu
- How do you receive credit for this class? Hand-in the solutions to all problems in all assignments. Your solutions will be read, but not graded. You might receive the homework back for corrections if they are needed.
- Will you get feedback? Yes, at the beginning of each class.
- Can you discuss assignments with your classmates? Yes, but solutions are to be your own.

Course Policies

Attendance and Participation:

Although attendance and participation in class are not required, they are highly encouraged. Keep in mind the following points:

- Our sessions will be interactive, so I encourage you to bring your laptops to class. Prior to each lecture, I will distribute the general skeleton of the code that we will cover. You will be asked to execute this code and solve certain problems in class. Some of these problems will be part of the weekly assignments, so if you come to class and participate, you will have a good portion of each week's assignment ready by the end of each session.
- Attending and being active in class by asking and answering questions will benefit your and your classmates' learning. For example, if you have a question during the lecture, do not be afraid to ask!, chances are that others are confused on the same point as well.
- If you miss a lecture it is your responsibility to catch up with the contents of the class. Make sure you read the R script associated with the lecture and submit the corresponding homework on time.

Access and Accommodations:

Your experience in this class is important to me. If you have already established accommodations with Disability Resources for Students (DRS), please communicate your approved accommodations to me at your earliest convenience so we can discuss your needs in this course. If you have not yet established services through DRS, but have a temporary health condition or permanent disability that requires accommodations (conditions include but not limited to; mental health, attention-related, learning, vision, hearing, physical or health impacts), you are welcome to contact DRS at 206-543-8924 or uwdrs@uw.edu or disability.uw.edu. DRS offers resources and coordinates reasonable accommodations for students with disabilities and/or temporary health conditions. Reasonable accommodations are established through an interactive process between you, your instructor(s) and DRS. It is the policy and practice of the University of Washington to create inclusive and accessible learning environments consistent with federal and state law.

Academic Integrity:

Students at the University of Washington (UW) are expected to maintain the highest standards of academic conduct, professional honesty, and personal integrity.

The UW School of Public Health (SPH) is committed to upholding standards of academic integrity consistent with the academic and professional communities of which it is a part. Plagiarism, cheating, and other misconduct are serious violations of the University of Washington Student Conduct Code (WAC 478-120). We expect you to know and follow the university's policies on cheating and plagiarism, and the SPH Academic Integrity Policy. Any suspected cases of academic misconduct will be handled according to University of Washington regulations. For more information, see the University of Washington Community Standards and Student Conduct website.