

TidyBiology: An Introduction to Biological Data Science in R

CMB710: Cell and Molecular Biology Core Course

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Class Dates: 10/9/2019 - 10/21/2019

Class time: 10:20am – 11:40am

Classroom: LSRC C144

Office hours: Slack is a versatile communications and collaboration tool used in this course. Students are discouraged from using email for questions and discussions related to content of the course; only emails about personal matters are allowed. Hence, most course communication happens on Slack. Both public (for announcements and general questions) and private (for team communication) channels are used. Feel free to post anytime for help.

Overview: This workshop-style module provides an introduction to the emerging field of Data Science in R, including data analysis and visualization, with a particular focus on its utility for biological insight. Students will be provided with biological datasets, and introduced to R packages and code used to examine data. In the first half of each class, students will be lectured on methods and shown demonstrations; in the second half of each class, students will use tools to analyze real data. Methods for filtering, sorting, and transforming data will be discussed along with visualization tools and options. Particular attention will be paid to code interpretation and data provenance methods by learning to generate reproducible data output files. For a final project, students will be given a new dataset to analyze using the tools learned during the course, and will share findings with the class in a short oral presentation. Although specific datasets will be used for analysis in class, this workshop will provide broadly applicable tools to reproducibly analyze and visualize data across the biological sciences.

Objectives: By the end of this course, students will be familiar with R, the RStudio Integrated Developer Environment, exploratory data analysis, and the tools and concepts of the tidyverse. The overall goal is to provide students with enough initial training that they can continue to learn these tools beyond the class.

Evaluation: Final grade will be calculated based on the following:

40% Code, R markdown file, and summary interpretation of findings

40% In-class presentation of above findings

10% Attendance

10% Participation

Attendance & Participation: This course is hands-on and experientially oriented. Students must bring a laptop computer to class. Activities in class will require you to:

1. Complete the pre-class assignments
2. Be punctual
3. Be an active participant

You are expected to attend and participate in every class meeting. If you miss any class for any reason, you must let the instructors know and are responsible for finding out about any assignments or information from class.

Academic Integrity: Duke University is a community dedicated to scholarship, leadership, and service and to the principles of honesty, fairness, respect, and accountability. Citizens of this community commit to reflect upon and uphold these principles in all academic and non-academic endeavors, and to protect and promote a culture of integrity. To uphold the Duke Community Standard:

- * I will not lie, cheat, or steal in my academic endeavors;
- * I will conduct myself honorably in all my endeavors;
- * I will speak-up if the standard is compromised.

Commitment to Diversity and Inclusion: Duke aspires to create a community built on collaboration, innovation, creativity, and belonging. Our collective success depends on the robust exchange of ideas—an exchange that is best when the rich diversity of our perspectives, backgrounds, and experiences flourishes. To achieve this exchange, it is essential that all members of the community feel secure and welcome, that the contributions of all individuals are respected, and that all voices are heard. All members of our community have a responsibility to uphold these values. If you have any concerns about diversity and inclusion in our class, please do not hesitate to reach out to your instructors.

Class Schedule

Date	Topic	Homework
Pre-class	‘Data science for the scientific life cycle eLife’	Install R, RStudio, Slack; sign-up for RStudio.cloud
Oct 9	Introduction to Data Science, the R programming language, the Tidyverse packages	Project 1, and begin help file
Oct 11	Dplyr package and data wrangling	Project 2, continue help file
Oct 14	ggplot package and making graphs	Project 3, continue help file
Oct 16	Joining and shaping data, strings, and models	Project 4, continue help file
Oct 18	Rmarkdown, knitr, and presentation skills	Finalize report, help file, and presentations
Oct 21	Final Presentations	NA