Department of Microbiology, University of Manitoba

STAT 4600 – Applied Biostatistics

Tentative Course Outline, Fall Term 2019

Course Details

Course Schedule: Wednesday 14:30 to 17:00

Prerequestites: An introductory course in biology

Familiarity with the R Programming Language

Location: 312 Machray Hall

Instructor Contact Information

Instructor: Aleeza Gerstein

Office Location: 364 Machray Hall

Lab Location: 412 Buller Buildilng

Phone: (204) 272-1681

Email: Aleeza.Gerstein@umanitoba.ca

General Goals and Course Description

This course will be focused on learning some theory and the particularly the application of 'modern' statistics to cutting-edge biological data. There are no formal lectures. Students are expected to thoroughly read assigned material prior to attending class. Course time will be used to work through the material as a group, both intellectually and the code. Hence a major component of the class is participation and preparation: coming to class with a list of questions or comments on the material and participating in working through problems that arise. Students will also learn how to effectively moderate discussions and conduct peer evaluations.

Course Objectives

1. To understand central concepts in modern statistics
2. To utilize the R Programming language to apply these statistics to biological data
3. To build a research toolkit:
   apply techniques for reproducible research
   develop discussion participation techniques
   practice science communication skills

Outline of Covered Topics

1. Introduction & reproducible research
   (.Rproj filles, the 'here' package, markdown, github)
2. Generative models for discrete data
   (number of mutations, epitope detection)
3. Statistical modeling
   (DNA base pair counts, Hardy-Weinberg equlibrium, haplotype frequencies)
4. Mixture models
   (ChiP-Seq data, next generation sequencing read counts)
5. Clustering
   (single cell RNA-seq, flow cytometry, cell clustering, 16S metagenomics)
6. Multivariate analysis
   (species abundance, mass spectroscopy)
7. High-throughput count data
   (RNA-seq)

Textbook and Other Materials

Textbook: Modern Statistics for Modern Biology.
Full book: `http://web.stanford.edu/class/bios221/book/`
Order: `https://www.cambridge.org/us/academic/subjects/statistics-probability/statistics-life-sciences-medicine-and-health/modern-statistics-modern-biology?format=PB`

Assignments, Test and Exams

Assignments: There are no formal (graded) assignments, though students will be expected to work through problem sets as part of their preparation for discussions. There will be one final project.

Exams: There will be no exams.

Readings: You will be required to do significant readings and problem solving outside of class time.

Course Evaluation and Grading Scheme

Final Mark: The final mark for the course will be obtained from the following:

Preparation for and participation in discussions	40%
Discussion moderation	20%
Final project	20%
Final presentation	10%
Peer evaluation	10%

Letter Grade: I normally use the following cutoffs when assigning letter grades:

Letter Grade	Mark out of 100
A+	90-100
A	80-90
B+	75-80
B	70-75
C+	65-70
C	60-65
D	50-60
F	below 50

Technology in the Classroom

It is the general University of Manitoba policy that all technology resources are to be used in a responsible, efficient, ethical and legal manner. Students should restrict their use of technology to those required *for educational purposes*. Although computers are not required, it is expected that they will be helpful for discussion sessions. Electronic messaging, email, social networking, gaming, etc. should be avoided during class time.

Important Dates

The following dates are important to how the course will progress throughout the term.

Date	Information
September 11	First lecture
November 18	Last day for VW
December 4	Last lecture

Academic Integrity

Students are encouraged to discuss course material, including the final project. However, each student must hand in his or her own copy of the project. Copying from anywhere, including other students, books, or the internet constitutes a case of academic dishonesty and could have serious consequences.

The goal in this class (as in all academic pursuits) is to learn. If you are unclear on what is acceptable, please ask me or visit the Faculty of Science page on cheating and plagiarism at: `http://umanitoba.ca/faculties/science/undergrad/resources/webdisciplinedocuments.html`

ROASS Schedule A

Schedule "A" of the *Responsibilities of Academic Staff with regards to Students* (ROASS) policies of the University of Manitoba lists resources and policies for students. It is important that you familiarize yourself with these resources and policies. This document is available from the Department of Statistics web page at: `http://umanitoba.ca/science/statistics/`.

University of Manitoba Acknowledgement of Traditional Territories

The University of Manitoba campuses are located on original lands of Anishinaabeg, Cree, Oji-Cree, Dakota, and Dene peoples, and on the homeland of the Métis Nation.

We respect the Treaties that were made on these territories, we acknowledge the harms and mistakes of the past, and we dedicate ourselves to move forward in partnership with Indigenous communities in a spirit of reconciliation and collaboration.