Biochemistry 9545Q Macromolecular Informatics.

The course will typically meet twice per week Mondays and Wednesdays at 9:30-11:30, Sept 10, 12, 19, Oct. 1 & 3.

Instructor:

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NOTE: This is intended to be focused largely on theoretical aspects of analysis, and practical information on how to manage and keep track of your work

Requirements

Students will be expected to bring a functional laptop to class with the R programming environment already loaded and functional. Students should be familiar with the file system of their computer and be able to locate files associated with R on their own. Students should have a working plain text editor installed. For Macs this could include Textwrangler, for PCs this could include Notepad++. Atom is also a good choice. Students should have a copy of "Analyzing compositional data with R" (https://link.springer.com/book/10.1007%2F978-3-642-36809-7) loaded on their computer for reference. We will use many of the principles outlined in that book. In addition, I encourage students to get a copy of "R in Action" --- you will find this invaluable. There is a companion web site http://www.statmethods.net.

I expect that students will learn outside of class, by doing the readings and doing at least some of their own troubleshooting. We will not be installing much, but what we do install will help you to keep track and present your work in the future.

Sessions

1. An introduction to high throughput sequencing and data types generated in high throughput sequencing. An introduction to R, markdown and knitr (functional note taking and reproducible data analysis)
2. A further introduction to R, data types, installing packages, simple plots, exploring multivariate data
3. An introduction to Bayesian thinking. Monte Hall problem, Regression to the mean, Gambler's fallacy
5. An introduction to the error structure in high throughput sequencing. PCA and compositional biplots.
6. Correlations in compositional data
Assessments

1. The student will be required to submit a proper R program. Marks will be assessed based on ability to properly comment, ability to make a functional script, conciseness and proper form. This must be submitted in the form of a .Rmd document without external dependencies. There will be an oral component to the grading for this assignment.

2. The student will be required to make and properly interpret a compositional biplot from a dataset provided. The student will be required to solve and explain some simple problems based on probabilistic thinking. There may be an oral component to the grading for this assignment.

3. The student will be required to examine and interpret the correlation and pairwise abundance of parts of a high-throughput sequencing dataset.

The course is largely theoretical. Assessments are to be worked on and handed in individually, and are equally weighted. Students will be expected to conduct independent learning to practice the concepts and tools. Here is where you will find the R in Action book or the companion website invaluable.

Sources

This should be all you need, aside from some R packages

- R installation: http://cran.utstat.utoronto.ca
- Markdown: http://daringfireball.net/projects/markdown/
- R studio and markdown: http://rmarkdown.rstudio.com

Readings:

- how does multiple testing correction work? Nat. Biotech. 2009 27:1135
- how to make more published research true. PLoS Medicine. 2014 11:e1001747
- it’s the effect size stupid. http://www.leeds.ac.uk/educol/documents/00002182.htm
- the fickle P value generates irreproducible results. Nat. Meth. 2015. 12:179
- It’s all relative: analyzing microbiome data as compositions, 2016, 26:322

Due dates

All assignments are due one week after they are given. All three assignments must be handed in and passed to obtain course credit.
Statement on Academic Offences

The statement: Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site:

Additionally, "All required papers may be subject to submission for textual similarity review to the commercial plagiarism-detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (http://www.turnitin.com)."

Plagiarism: Students must write their essays and assignments in their own words. Whenever students take an idea or a passage from another author, they must acknowledge their debt both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. Plagiarism is a major academic offence (see Scholastic Offence Policy in the Western Academic Calendar).

As part of a successful graduate student experience at Western, we encourage students to make their health and wellness a priority. Western provides several on campus health-related services to help you achieve optimum health and engage in healthy living while pursuing your graduate degree. For example, to support physical activity, all students, as part of their registration, receive membership in Western’s Campus Recreation Centre. Numerous cultural events are offered throughout the year. Please check out the Faculty of Music web page http://www.music.uwo.ca/, and our own McIntosh Gallery http://www.mcintoshgallery.ca/. Information regarding health- and wellness-related services available to students may be found at http://www.health.uwo.ca/

Students seeking help regarding mental health concerns are advised to speak to someone they feel comfortable confiding in, such as their faculty supervisor, their program director (graduate chair), or other relevant administrators in their unit. Campus mental health resources may be found at http://www.health.uwo.ca/mental_health/resources.html

To help you learn more about mental health, Western has developed an interactive mental health learning module, found here: http://www.health.uwo.ca/mental_health/module.html. This module is 30 minutes in length and provides participants with a basic understanding of mental health issues and of available campus and community resources. Topics include stress, anxiety, depression, suicide and eating disorders. After successful completion of the module, participants receive a certificate confirming their participation.
Helpful Resources @ Western for Graduate Students

Writing Support Centre  http://www.sdc.uwo.ca/writing/  SDC’s Learning Skills Services,
Rm 4100 WSS, www.sdc.uwo.ca/learning

LS counsellors are ready to help you improve your learning skills. We offer presentations on strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Individual support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre, and year-round through individual counselling.

The Student Success Centre:  http://success.uwo.ca/